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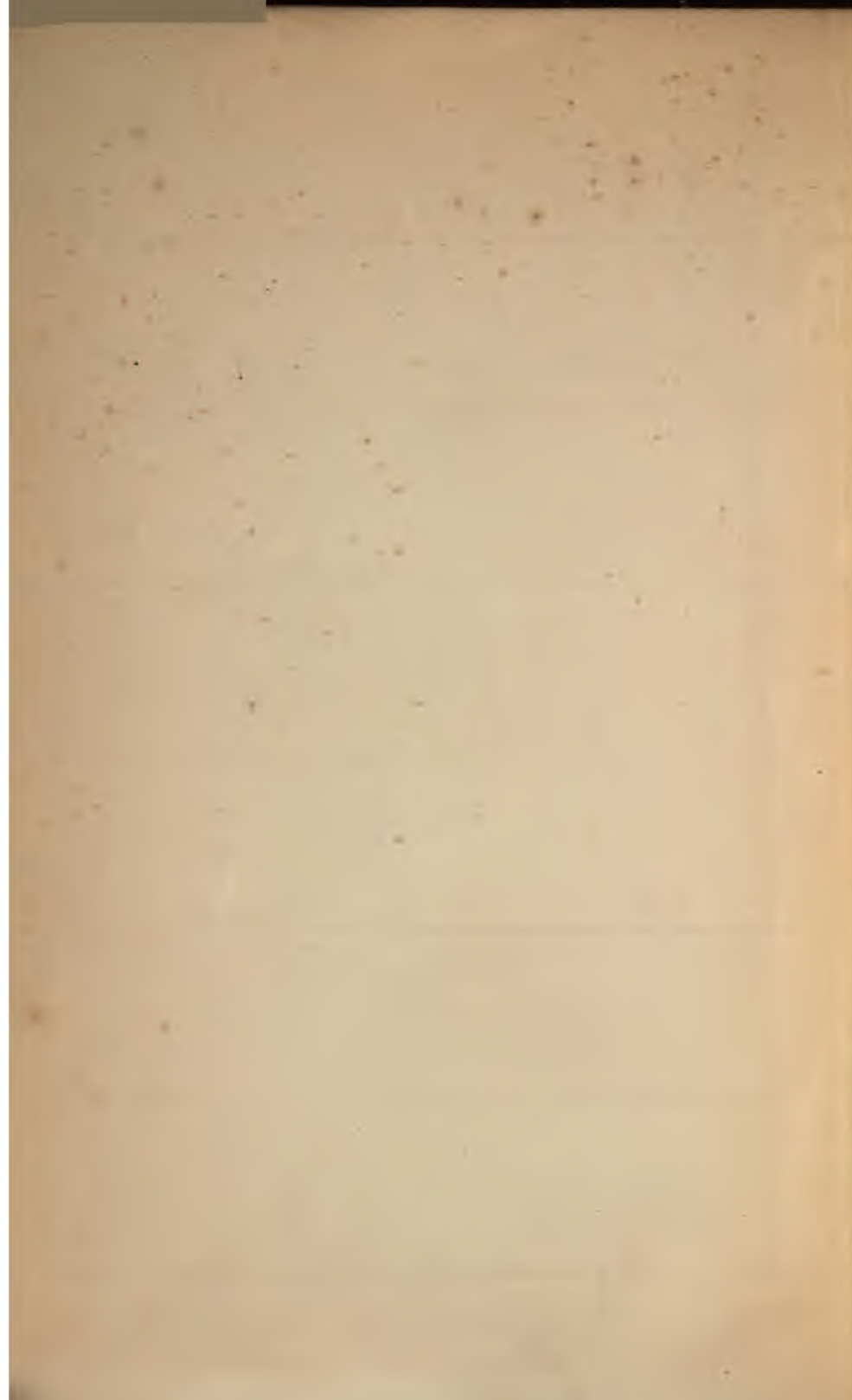
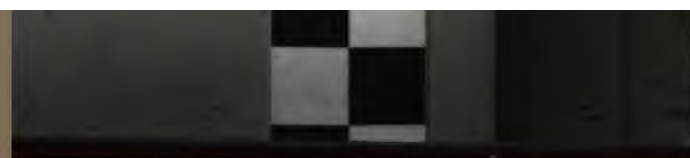
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**HISTORY OF MEDICINE**  
**AND NATURAL SCIENCES**

AMERICAN BOOK COMPANY











**THE CLIMATES AND BATHS**  
**OF**  
**GREAT BRITAIN**







# CLIMATES &

Land below 250 ft.   
 above 250 - 500 ft.   
 500 - 1000 ft.   
 1000 ft. 

*Isothermals showing the Mean Temperature for the Winter Quarter (December to February) based upon an average of 24 years, 1857-80.*

*Note.—The Quarterly Means were calculated from data contained in D<sup>r</sup> Buchan's paper "The Mean Temperature of the British Islands," which was published in the Journal of the Scottish Meteorological Society, New Series, N<sup>o</sup>s 54-59, 1882.*





THE  
CLIMATES AND BATHS  
OF  
GREAT BRITAIN

BEING THE  
REPORT OF A COMMITTEE  
OF THE  
ROYAL MEDICAL AND CHIRURGICAL SOCIETY  
OF LONDON

W. M. ORD, M.D., *Chairman*  
A. E. GARROD, M.D., *Hon. Secretary*

VOLUME I  
*THE CLIMATES OF THE SOUTH OF ENGLAND, AND THE  
CHIEF MEDICINAL SPRINGS OF GREAT BRITAIN*

*Contributors*

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## PREFACE

At a meeting of the Council of the Royal Medical and Chirurgical Society, held on May 14th, 1889, Sir Edward Sieveking in the chair, it was resolved, on the motion of Dr. Barnes, seconded by Dr. Ord, "That a scientific committee be appointed for the purpose of investigating questions of importance, in reference to the climatology and balneology of Great Britain and Ireland, and to report hereon to the Council from time to time; with power to add to their numbers."

In accordance with this instruction a committee was formed, of which Dr. Ord was nominated as chairman. As first constituted, the committee consisted of—Dr. Ord, Dr. Ballard, Dr. Mitchell Bruce, Dr. Dickinson, Dr. Murrell, Dr. Frederick Taylor, Mr. Treves, Dr. Symes Thompson, Dr. Hermann Weber; of these Dr. Ballard and Mr. Treves have unfortunately been unable to serve.

The following are the names of those subsequently added to the committee :—Dr. Ewart, Dr. Theodore Williams, Dr. Penrose, Dr. Norman Moore, Dr. Barnes, Dr. F. Roberts, Dr. Cheadle, Mr. Malcolm Morris, Dr. Maguire, Dr. Lazarus-Barlow, and Dr. A. E. Garrod, who was appointed to act as honorary secretary.

Having received the mandate of the Council, the committee proceeded to institute inquiries of a general character. It formulated letters to be addressed to medical men practising in the more important climatic resorts and in the more important bath-places. It also drew up a form of inquiry to be addressed to medical men connected with the smaller spas.

After the issue of such letters of inquiry, the committee decided to intrust to certain of its members the personal investigation of

districts having important climatic value, and of the several bath-places. In both aspects, a thorough appreciation and use of published and recognised meteorological reports was indispensable. The investigators had access to the reports of the Meteorological Office and of the Royal Meteorological Society; and have been greatly indebted to Mr. Scott of the former, and to Mr. Marriott of the latter. They have been also fortunate in having as a member of the committee Dr. Theodore Williams, lately President of the Royal Meteorological Society.

The inquiries made by the committee met with a very encouraging response. The committee is indebted to those gentlemen who have replied, and who have devoted no small amount of time and labour to furthering the objects in view.

In its first report the committee has to present the results of three lines of investigation, viz. :—

I. The information received from medical men, practising in various localities, in answer to the letters of inquiries.

II. The results of personal investigation, in various localities, by members of the committee.

III. The analysis of published and trustworthy statistics regarding the several localities considered.

In respect of climatology, it may be stated that, so far, the inquiries have related, chiefly to the south coast of England, from the Land's End to the North Foreland. It must be understood that climatology here includes inquiry into the relative prevalence of health and disease, and into the influence of the climate on health and disease, in the several districts under examination.

In respect of balneology, the reports embodied in the present volume deal with the more important spas of Great Britain, and with certain minor mineral springs which are conveniently classed with these.

The committee hopes to deal in a further report with the climatology of the remaining districts, and with those mineral springs which are not included in the present volume.



LIST OF THE COMMITTEE  
AS AT PRESENT CONSTITUTED

W. M. ORD, M.D., *Chairman.*

ROBERT BARNES, M.D.

J. MITCHELL BRUCE, M.D.

W. B. CHEADLE, M.D.

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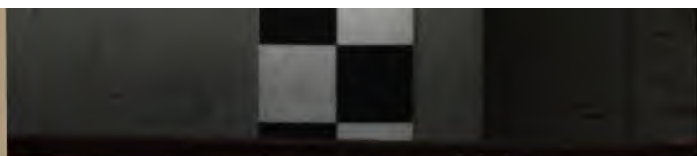
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*The following are the Circular Letters which were sent to the Medical Men practising at the various health resorts and bath-places:—*

1. LETTER ASKING FOR INFORMATION REGARDING A CLIMATIC RESORT.

DEAR SIR,

A Committee has been appointed by the Royal Medical and Chirurgical Society to investigate the Climatology and Balneology of Great Britain and Ireland. In pursuance of this object the Committee ventures to ask the aid of the medical men practising at the various health resorts (and at other places to which interest attaches in this relation), who alone possess the experience necessary for the formation of a just estimate of the therapeutic value of their climates.

Information is desired upon the following points with regard to .....

- I. The prevalence among the permanent residents, or the inter-currence in visitors, of the following diseases; and the influence of the climate upon patients sent there for the treatment of any of them.

A. *Anæmia and Debility.*

B. *Scrofula and Tuberculous Diseases, except Phthisis Pulmonalis.*

C. *Diseases of the Respiratory Organs.*

Phthisis (with special reference to hæmoptysis).

Bronchitis and Catarrh.

Pneumonia.

Pleurisy.

Asthma.

D. *Renal Diseases.*

Acute Renal Dropsy.

Chronic Albuminuria (state whether presumably associated with granular kidney).

Calculus and Gravel.

E. *Rheumatism, Rheumatoid Arthritis, and Neuralgiæ.*D. *Diseases of the Skin, particularly Eczema.*G. *Endemic Diseases.*

Malarial Affections.

Typhoid Fever.

Diarrhœa.

Scarlet Fever.

Diphtheria.

Endemic Sore Throat.

II. The common causes of death, and frequency of old age, among the permanent residents.

III. The system of drainage adopted.

IV. The water supply.

*The following Outline for Climatological Reports was sent with the above letter :—*

## GENERAL PART.

1. Definition of District.

2. General Physical Characters of District.

*Protection from winds.**Exposure, &c.*

3. Brief Notice of Geological Formation, and Soil ; with special reference to Dryness and Humidity.

*Configuration of surface, in relation to natural drainage.**Elevations.**Protection from wind, rain, and fog.*4. Trees, as affording Protection, and Modifying Climate.  
Vegetation, as evidence of character of Climate.

5. Effects of Ocean Currents upon Climate of District.

6. General Description of Climate and Meteorology of District,  
with analysis of, and deductions from, the Tables.*Temperature of air, humidity, &c.**Prevailing winds, sunshine.**Rainfall, fog.*

7. Characters of the Climate in different seasons.

## SPECIAL PART.

8. Detailed consideration of the climatic characters, and special features of limited districts and resorts, with some mention of—

*Drainage.*

*Water supply.*

9. Prevalence of diseases, as given in circular letter.  
10. Therapeutic effects of the Climate, or Climates, with indications as to their uses in particular Diseases.

---

2. LETTER ASKING FOR INFORMATION CONCERNING A BATH-PLACE.

DEAR SIR,

A Committee has been appointed by the Royal Medical and Chirurgical Society, to investigate the Climatology and Balneology of Great Britain and Ireland, and it has been decided that a letter shall be sent to medical men practising at the various Bath-places, asking them to be kind enough to give information upon certain points relating to the characters of the mineral waters, the methods of their use, and their therapeutic properties.

The Committee will esteem it a great favour if you will kindly give the benefit of your experience upon any of the following points concerning the waters of \_\_\_\_\_

- I. *What are the morbid conditions which have, in your experience, been treated with advantage by—*
- A. *The internal use of the waters.*
  - B. *Their external use.*
  - C. *Their combined internal and external use.*
  - D. *The use of the waters in conjunction with other forms of treatment—e.g., by drugs, massage, and other special methods.*

*The subjoined list will indicate to you, in a general way, the affections in respect of which information is specially sought, but the Committee will be grateful if you will furnish any statement which you could make about affections not obviously included in the list.*

*Gout and Gouty Affections.*

*Osteo-Arthritis or Rheumatic Gout.*

*Rheumatism.*



*Muscular Rheumatism.*

*Gonorrhæal Arthritis (or Gonorrhæal Rheumatism).*

*Sciatica.*

*Syphilis.*

*Tubercular and Scrofulous Affections.*

*Anæmia.*

*Diseases of the Skin, with special reference to Eczema and Psoriasis.*

*Diabetes and Glycosuria.*

*Urinary and Renal Diseases.*

*Diseases of the Respiratory System.*

*Diseases of the Circulatory System.*

*Diseases of the Digestive System (including the Liver).*

*Diseases of the Nervous System.*

*Diseases of Women.*

*Results of Injury.*

- II. *What are the various ways in which the Waters are employed, and what forms of treatment, if any, are had recourse to, apart from, or in addition to, the use of the Mineral Waters?*
- III. *In what conditions do you consider the use of the Waters to be contra-indicated—*
- A. *By the character of the disease proposed to be treated?*
- B. *By the state of the patient apart from the disease proposed to be treated?*
- IV. *At what time of year should the treatment be undergone?*

## NOTES ON THE METEOROLOGICAL DATA INCLUDED IN THE TABLES PUBLISHED IN THE REPORT

BY E. J. HORSTMAN

SENIOR COMPUTER TO THE ROYAL METEOROLOGICAL SOCIETY

The *Mean Pressure of Atmosphere in Month* is the mean of the daily readings of the barometer at 9 A.M. and 9 P.M., corrected for temperature and reduced to sea-level.

The *Highest Temperature of Air in Month* is the absolute highest of the daily readings recorded by the self-registering maximum thermometer.

The *Lowest Temperature of Air in Month* is the absolute lowest of the daily readings recorded by the self-registering minimum thermometer.

The *Monthly Range of Temperature* is the difference between the absolute highest and lowest temperatures registered in each month.

The *Mean of Highest Temperatures of Air in Month* is the average of the daily maximum temperatures.

The *Mean of Lowest Temperatures of Air in Month* is the average of the daily minimum temperatures.

The *Mean Daily Range of Temperature in Month* is the difference between the average of the daily maximum and the average of the daily minimum temperatures.

The *Mean Temperature of the Air in Month* is obtained by adding together the average of the daily maximum and the average of the daily minimum temperatures, and dividing their sum by 2.

The *Mean Humidity* is calculated by dividing the elastic force of aqueous vapour, at the temperature of the dew point at 9 A.M. (as determined by

Glaisher's factors) by the elastic force of aqueous vapour corresponding to the temperature of the air at 9 A.M. (*i.e.* reading of dry bulb thermometer).


The *Amount of Sunshine* is the total of the daily records made by the sunshine recorder.

*Wind*.—Observations of the *Direction of the Wind* are made twice daily, viz. at 9 A.M. and 9 P.M., and the figures in the tables are the sums of these two observations.

*Rain* is measured daily at 9 A.M., and the amount entered to preceding day, A fall of .006 inch and above constitutes a *day of rain*.

The *Amount of Cloud* is for 9 A.M., and is estimated according to the scale 0 to 10; 0 representing a cloudless sky, and 10 a completely covered or overcast sky.





## INTRODUCTORY REMARKS ON THE CLIMATES OF THE SOUTH OF ENGLAND

By W. M. ORD, M.D., F.R.C.P.

Two voices are there ; one is of the sea,  
One of the mountains ; each a mighty voice.

WORDSWORTH.

IF the lines above quoted are true of England and of Switzerland in reference to freedom, they may be felt also to suggest a complementary comparison of the resources of the continent of Europe and of our islands in relation to the restoration of health to the sick. When we take into consideration the whole of the Continent we have to recognise that while it possesses a relatively small seaboard, its main health resources lie inland and mostly in mountainous districts. In our islands the proportion is reversed, our inland baths, chiefly again found in districts considerably elevated above the sea, are, as we shall have to expound more fully later on, few, though important. In this introduction we propose only to deal with the southern counties of England and the coast from the North Foreland to the Land's End. In summer and in winter there flows to these regions a ceaseless stream of health seekers and pleasure seekers. Limited as the piece of coast mentioned may be, it presents in its small space an extraordinary variety of outline, soil, and climatic influences flowing from the sea as well as from the land. It is no long flat shore of sand ; it is more than chalky cliffs. The line in which the various geological formations run from the north and east of England in a south-westerly direction makes our south coast present as we go from east to west a rapidly succeeding and often alternating series of coast sections cutting a large proportion of known strata, from tertiary formation at the

mouth of the Thames to granite at the Land's End. Tertiary strata are found not only in the mouth of the Thames, but also in the Isle of Wight and in the adjacent parts of Hampshire. The chalk, forming fine cliffs, frequently with a beach of sand, crops out abundantly, in the Isle of Thanet, at Beachy Head and Brighton, on the east of Swanage Bay, in the bay of Weymouth, at Warbarrow, and Lulworth, and forms the back-bone of the Isle of Wight, the chalk heads of Swanage being a continuation of Freshwater Down and the Needles. The softer wealden is found at several points in Sussex, Kent, and Dorset, determining the occurrence of bays. The oolite forms massive cliffs and headlands in the Isles of Purbeck and of Portland, the solid rocks rising from the sea, in many places without yielding so far as to form a beach. The lias is well represented about Lyme Regis, and the red sandstone at Sidmouth. Some of the most superb coast scenery in the country depends upon the existence at the Lizard of the Serpentine rocks, and granite lends its strength to the magnificence of our extreme westward headlands.

As an outcome of this frequent change of substance in the seashore follows the remarkable variety in the outline of the coast already mentioned. This is indeed much more than a mere variety of outline; it consists also in rapidly succeeding diversities in the elevations of the projections and recessions, so that in a coast which looks in the main southward, a rich series of contrasts of aspect is obtained. Where a ridge comes down from high inland into the sea, its shelving sides are found to embrace great differences of climate within a small area. We may find one side of a bay exposed to east winds, with an air which is found to be tonic and bracing, while, on the other side, with a westerly or south-westerly aspect the sun pours in, on a beach lying at the foot of high cliffs, with almost tropical warmth; and one side of a headland may be so warm as to be held to be relaxing, while the other is cool and invigorating.

Such a contrast, fairly well marked on the northern and southern aspects of the Isle of Thanet, is even more strongly illustrated in Cornwall, where a backbone of high land runs between the north coast and the south, and divides the seaboard of the county into two regions of remarkable climatic contrast. The southern coast here includes probably the warmest places to be



found in our islands; the bold northern seaboard having also a more robust climate. Minor contrasts of the same kind are found abundantly along the southern coast. The differences thus dependent upon the conformation of the coast and of the inland country would doubtless be more marked were it not for the influence of the sea. The Gulf Stream, impinging on the western extremity of Cornwall, brings about conditions of atmosphere which are very different from what would occur if our islands were situated in an inland sea, instead of being Atlantic outposts.

In Cornwall it results that the temperature of the north coast is warmer and softer than its physical constitution would involve; so also the more genial aspect of the southern part of the county is intensified, and its advantage of exposure is perhaps diminished by the excessive moisture of the winds constantly blowing from the warm surface of the water.

The functions of the Gulf Stream, however, do not end here. It is found mellowing the atmosphere all along the south coast, and no doubt determines, in an important way, the comparatively small average differences of temperature in the two extremities. The great fertility of this coast, seen in the rich green of the fields, in the fine growth of trees where the winds are not too powerful, and in the singular perfection of agricultural products, are doubtless all due to the warm moisture constantly breathing over the land. This is particularly illustrated in the islands around the coast—viz., in the Scilly Isles first of all, in the Channel Islands, and in the Isle of Wight.

To analyse the attractions of this part of our coast is not so easy as it may be profitable. Probably the first impulse to its visitors has been something like that of a migration of healthy persons drawn to the sea shore by the vigour of life which may there be enjoyed. Underlying all the various enjoyments of our population is certainly a strong instinct to seek maritime surroundings and muscular exercise. In the earlier part of this century it was by threads of this kind that such people as could afford the expense were drawn to the south coast. One class found its appropriate outlet in Margate, another and a very different one in Brighton, when as yet what one may call the title of the denizens of the inland to use of the seaside had only begun to be established. Even then the places which

may be called bracing were chiefly frequented. In process of time our manner of life has changed, until nowadays manifold pleas are acknowledged to justify for all classes an annual trip to one or other of the many harbours and promontories which stud the coast. The uses of the coast have gradually broadened; at first, healthy people drove or walked along cliffs, or disported themselves upon the sands or in the water, took boat of one kind or another, and feasted their eyes on the shipping constantly passing between them and the horizon. Following upon this activity came further the knowledge that many places afforded rest for the weary. There were, and are, places in which repose of the most complete kind can be obtained, in the presence of great beauties of nature, and few of the localities of most tumultuous resort are wanting in spots, from which, under the shelter of cliff or woodland, the eye may gaze peacefully on the infinite complexion of the sea, and feel complete relief from the *fumum et opes strepitumque Romæ*.

Among the multitude of the immigrants not a few must have taken their families with them to the sea, and have brought back to their homes the story of many a renovation of health in their sickly ones. Nowadays recreation and health are almost equally sought and equally ministered to by the several towns and villages on the coast, readily reached by a profusion of railways. A rivalry has sprung up among the several towns and districts, resulting in the supply of all degrees of comfort and luxury, and of ministration to the needs of the sick and ailing. While, on the one hand, amusements, comprehending, besides what may be called entertainment; such as music, assembly rooms and theatres; croquet, lawn tennis, cricket, and golf, far more healthy and more suited to English taste, are freely available, there are not wanting restful and sheltered places for the weak and fragile, and specially constructed walks and roads in which the full influences of the sun may be obtained with a minimum exposure to cold winds.

The great benefits derived from the inhalation of fresh sea air and from sea bathing cannot be too highly appreciated, but, as in the case of all other remedial agents, their use has its bounds and its qualifications. People accustomed to a non-invigorating inland atmosphere cannot with impunity expose themselves to the often



keen air of the seaside. As a rule they require warmer clothing than at home, and when want of strength reduces the power of taking exercise the sense of drinking-in health with the air does not justify sitting for long in exposed positions and without shelter. In respect of bathing we may speak more strongly. It is certainly a popular idea that whereas a wetting with fresh water or a prolonged bath in the same tend to produce ill-effects, sea water is always innocuous and stimulating. This, in our opinion, is a serious error. On or near the shore at least, though it may be different on ship-board out at sea, a man whose clothes are drenched with sea water is just as likely to contract "a cold" as a man whose clothes are soaked with rain; and, when we come to bathing, the belief in the harmlessness and tonic power of sea water requires more serious correction. It is to be borne in mind that the average temperature of the water on our coasts, although raised by the presence of the Gulf Stream, is not more than about 50° F.; that is to say, at least 48° less than the temperature of our bodies. Even for robust persons, of good swimming power, a prolonged immersion is productive of exhaustion. Doubtless strong people and perhaps even weakly ones can stay in the stimulating salt water longer than they can in fresh without feeling the bad effects of the lowering of the temperature of the body,—and it must be admitted, nay urged, that every individual body has its own rule. In use even for healthy people, coming from the enervating air of large cities the first baths should certainly be of short duration. They should include, if possible, a plunge into water sufficient to cover the shoulders, and if possible a short swim. The water should be quitted in a few minutes, before depression has followed stimulation. The condition of the bather after the resumption of his clothes will soon afford a test of the exposure which he may undergo with advantage. This will consist, on the one hand, in a sense of warmth, refreshment, and readiness for muscular activity; on the other hand, subsequent feeling of nausea, of chilliness, of headache, or of palpitation will show that the just measure has been exceeded.

We have to consider, finally, the various aspects and uses of our south coast in detail. Keeping in mind the fact that the relation between coast and sea is of first importance, we have roughly spoken of what is comprehended between its two extremities; but

it must be remembered that on the eastern side between the Nore and the North Foreland, and on the western side, between the Land's End and the mouth of the Severn, we have to include a little more than is, strictly speaking, appertaining to this area. Moreover the reports, to which these remarks are introductory, are so carefully drawn up as to include parts of the southern counties, such as Surrey, which, though not in contact with the sea, feel its influence, and form a group intermediate between the actual seaboard and the interior of the country. Moving from the west, we find in Cornwall and the Scilly Isles a region exhibiting remarkable physical characters and most important climatic value. The Scilly Isles present a climate entirely derived from the sea; they consist of granitic rocks uprising, so to speak, in the midst of the Gulf Stream, and illustrate to the full the influence of this current, where no differences of soil or of inland conformation offer any complication. We find there a singularly equable climate, warmer on the whole than that which obtains upon the mainland, yet vexed by storms of tremendous power. If, as we can well believe, the working of climate upon human beings can be estimated by its working upon the vegetable kingdom, these islands should be greatly helpful to many persons suffering from the effects of our English winter.

The county of Cornwall itself repeats some of their advantages. It projects as a long promontory into the oceanic area, reaping, on either side, the full benefit of the Gulf Stream. As we have already indicated this promontory is not flat, but is traversed by a backbone of hill, running between the north and south coasts; a backbone of fair elevation and of dry soil; scanty therefore in the formation of rivers, and, to all appearance, tempering the force and modifying the quality of the winds blowing across it from one coast to the other. The reports show that Cornwall possesses a higher and more equable temperature than the rest of the south coast, and that the sea is considerably warmer than the air, particularly between Padstow and St. Ives.

As we travel eastward from Cornwall, the thin wedge of that county is broadened into the adjoining counties of Devonshire and Somerset. Both of these counties present great varieties of coast outline and elevation; on the north, where both counties are concerned, bordering on the Bristol Channel; while on the south



Devonshire presents a magnificent coast outline from Plymouth to the edge of Lyme Regis.

The greater elevations of Dartmoor and Exmoor have a sheltering influence upon both coasts. Here, as in Cornwall, vegetation, even subtropical, is luxuriant, and the richness of these counties in the product of their grazing areas is proverbial.

The coasts possess a great variety of climates due to differences of outline, and therefore of exposure. We find here relatively bracing air at Ilfracombe, continuing the line of north Cornwall, and beautifully sheltered spots, such as Lynton on the north, and an abundance of towns and hamlets on the south, for the detail of which we can only refer to the reports which follow.

The coast of Dorset and Hampshire includes many places of great resort and celebrity, from Lyme Regis to Hayling Island, with the Isle of Wight as a marine outpost of singular beauty and salutary usefulness.

The bearing of geological formation upon the climate of seaside places is remarkably illustrated in these counties. The lias cup of Lyme Regis affords a shelter from northerly and easterly winds hardly to be excelled. Bournemouth, with soil of tertiary sands, imbedded in pine-clad slopes of lesser elevation, and readily accessible from the metropolis, has similar but more fashionable advantages; while Swanage, at the mouth of a curved valley running from sea to sea between chalk downs and the coast elevations of the Purbeck, has a strongly contrasting bracing quality.

Almost every possible variety of climate is comprehended in the Isle of Wight, which is, as it were, a microcosm both of pleasure and health resort.

Whilst Dorset and Hants mark a transition from the warmth and moisture of Cornwall and Devon towards the colder aspect of the eastern county, the long coast of Sussex embraces gradations more marked though often varying in a way that, at first sight, might be unexpected. It has its low-lying regions, like Bognor and Littlehampton; its cliff projection, as at Brighton and Hastings; its areas of lesser height, such as at Eastbourne, lying under the westward shelter of Beachy Head. We may find interest in noting the contrast between the climates of Brighton, situated in great part on the cliffs; of Hastings, taking cover between them and the sea; and of Eastbourne, fronting the same bay as

Hastings, but with an eastward exposure. The nearness of these places to London gives to the inhabitants of the metropolis a ready access to at least three different kinds of climate available for invalids.

Lastly, Kent stands out in great contrast to our western counties. While, in the latter, climate and soil alike favour pastoral, in Kent agricultural use of the land is pre-eminently favoured. The coombes and richly-wooded valleys lying among the downs favour the growing of cereals, of fruits, and of the hop, so marked a characteristic of this region. If the Weald is the more fertile part of the district, we can readily see how it is favoured by the shelter of the long ridge of chalk downs which ends as our eastern wall, and determines the great importance of the Isle of Thanet as attractive to all kinds of visitors.

There is a curious mixture of resemblance and contrast between the two extremities of our southern coasts. Both are promontorial, and are therefore freely exposed to the sea breezes. If the Atlantic makes its mark on Cornwall and Devon; the Isle of Thanet, in Margate and its neighbourhood, looks northward, almost to the pole, without intervening land. Within the compass of a very few miles, extending round the promontory from Herne Bay to Ramsgate, a singularly pure and invigorating atmosphere, with unrivalled opportunities of sea-bathing are open to sick and hale.

So far we have not said anything about the Channel Islands which, although territorially British, belong geographically rather to the French coast. In respect of climate they repeat more or less what is exemplified in the Scilly Isles, but they are larger, have greater capacities for the reception of visitors, and must be regarded as important resorts for certain classes of invalids at all times of the year.

In conclusion we would submit that although the committee in general, and the authors in particular, have spared no pains to insure, as far as practicable, the accuracy of the reports, they are fully aware that in a work of this kind, comprising information of many sorts and from many sources, it is inevitable that a certain amount of error must have crept in. The utmost the committee can hope is that this is not greater than may, under the circumstances, be excused.



# THE CLIMATE OF CORNWALL

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## PART I

### GENERAL PHYSICAL CHARACTERS OF THE COUNTY

THE county of Cornwall has strongly marked physical characters, which would seem to entitle it to more consideration in connection with health than it has yet received. It comprises the most westerly as well as the most southerly portion of the mainland of Great Britain, together with a group of islands which lie in the Atlantic about thirty miles to the west of the Land's End. The attached and the insular portions of this county must be separately considered.

To take first the larger portion which belongs to the mainland. This forms the extremity of the western peninsula, of which Devon and Somerset constitute the base. It is eighty-one miles in length from the north-western limit of the county to the Land's End, while the width rapidly diminishes from about forty miles at the basal connection with Devon to an average of about twenty miles, which, roughly speaking, covers the distance from sea to sea over the greater part of the county. At the western extremity the distance is much less. Excepting within about twenty miles of the Devonshire boundary no spot can be found within the county which is more than ten miles from the sea in a straight line; towards the western extremity this distance is nowhere attained. The northern shore is watered by the Atlantic, the southern by the English Channel. A line drawn from any point of the northern coast, nearly at right angles to it, will reach land first in North America, having traversed two thousand

miles of ocean. The south coast impinges on the Channel at its broadest, of which about a hundred miles separate Cornwall from France. Thus whatever be the influences which the sea brings to bear upon climate they must predominate in Cornwall. These are enhanced or modified by the special relation which this county, more particularly towards its western extremity, presents to the Gulf Stream. This, or rather its continuation under the name of Rennell's Current, passes northwards from the Bay of Biscay, surrounds the Scilly Islands, to the great modification of their climate, as will be presently seen, and then impinges upon the Lizard. It is probable from the further course of the stream northwards to the west coasts of Ireland and Scotland that the north-west coast of Cornwall is especially exposed to it; but there is reason to believe that both coasts are thus influenced. Vegetable products of tropical origin are not infrequently washed ashore at the Lizard, on the north coast at Newquay, and I am told also at Trebarwith.

The influence of the Gulf Stream in modifying the climate of Cornwall may be inferred from the temperature of the water off the Cornish coast, as compared with that which touches the eastern shore of Great Britain.

Among the terrestrial features the most conspicuous and the most important climatically is the long range of hills and mountains which runs from the north-east corner to the south-western, through the entire length of the county, forming a vertebral ridge or plateau which may be described as dividing the district into three portions presenting marked physical differences. These portions consist of the elevated lands forming the central barrier, and the slopes connecting these with the northern and southern shores respectively.

To take first the high district. This is continuous with the high lands of western Devon about Dartmoor and Hartland, and is continued to the western extremity of the county by elevated undulations of sandstone and slate, interrupted by higher granitic regions, which resemble those of Dartmoor. The granite moorlands, sometimes mountainous in character, attain their greatest height in Brown Willy and Rough Tor, which are respectively 1380 and 1296 feet in altitude. The connecting lower but still elevated country, which is generally cultivated, occasionally rises to an elevation of 1000 feet. The high road between Launceston



and Camelford crosses tableland, which at its highest exceeds this altitude. The central ridge between Devonshire and the Land's End is generally 600 or 700 feet high, nowhere lower than 300, and as low as this only in a few places. Near the Land's End, where the country is entirely composed of granite, the barrier is generally lower than in other parts of the county, but even here it does not fall below 300 feet, and occasionally touches 700. Thus a continuous line of greatly elevated land traverses the county from the north-east to the south-west, protecting the southern coast-line from the north and west, and the northern coast-line from the south and east.

The character of the high central region may be briefly dealt with as not of much interest in regard to this inquiry. The high tableland is thinly inhabited, though cultivated; the higher granitic tracts of mountain and moor are nearly uninhabited. Trees are few and vegetation scanty; what trees there are are mostly sycamores, and in the sheltered hollows about houses. The general aspect of the country is bare and unattractive; it is swept by overpowering winds; snow falls here abundantly, and lies longer than in other parts of the county, though even here the amount and persistence of snow are much less than in other parts of the south of England. As regards medical climatology, the interest pertaining to the high central line is but slight as compared to what attaches to the southern and northern slopes, the sheltered lower districts, and the coasts which are generally well protected on the landward side.

The north-western and the south-eastern lines of coast are remarkably unlike in their general character, and present greater differences of climate than perhaps would have been thought likely, having regard to the short distance by which they are separated. The high central barrier is generally nearer to the north than to the south coast, closely approximating to the sea-line at each end of the county, represented by Stratton and the Land's End district, and bending to the south between these points, so that about Bodmin, which may be regarded as the centre of the county, the highest part is about equidistant between the two coasts.

The north-west coast, reckoning from Marsland Mouth to the Land's End, is over 100 miles in length, though it is not easy to measure with exactness this very irregular line. This

stretch of coast, more particularly if we add to it the five miles between the Land's End and the Logan Rock, is unequalled in Great Britain in regard to the beauty, grandeur, and variety of the scenery. The chief features of the picture are a sea of great force and wide-reaching influence, steep cliffs, and soft, fine sand. The cliffs rise for the most part abruptly out of the sea, without any interval of beach, at any state of the tide. In many bays and inlets, some very small, others several miles long, as near Newquay and Perran Porth, are accumulations of sand, in the shape of fore-shores and beaches, which are generally covered at high tide, exposed at low. Beside the sand thus washed by the sea, there are in places great accumulations of dry blown sand, which pass for several miles inland and transform the face of the country. The sand in many places is of considerable depth, and must modify the climatic influence by the extreme dryness of the subsoil, which, notably at Bude, Perran, and St. Ives, is largely composed of this material. Without describing the north coast in detail, it may be said that in general the surface is dry; the impervious slate and granite slope steeply to the sea, so that the rain-water runs readily off in numerous streams, the surface becoming comparatively dry soon after even a heavy rainfall. The earth therefore is generally dryer than would be expected, though the air is often abundantly charged with moisture from the rains, mists, and moist west winds which come from the Atlantic. The leading influences of the place are wind and sea; in some exposed places on the coast, as at Tintagel, the tomb-stones require to be supported by buttresses lest they should be blown down. But however overpowering the winds from the west, with the oceanic moisture which they convey, the east winds which reach this coast have undergone considerable modification since leaving the eastern and central portions of England. Without being able to speak with scientific exactness, the impression upon the senses is that the east wind has here lost many of its objectionable characters; not so much its cold, as its dryness and irritating nature. The belief in the neighbourhood is that the wind is modified in crossing Dartmoor, but it is probable that the backbone of Cornwall is also concerned in producing the change, bearing in mind the vicinity of this high land to the north coast, and its position to the eastward of it. Whatever be the cause, I think there can be no doubt as to the result.



The movement and force of the sea is shown by the height to which the surf rises when the waves strike the cliffs, often forming columns 200 feet high. The waves which are seen advancing upon the beach often carry above them delicate clouds of spray or mist, not always to be seen, but conspicuous in certain conditions of light and sun, which show to what an extent the air and sea are mingled. This is not peculiar to the Cornish coast, though I have seen it nowhere else as conspicuously displayed. The sounds of the sea also give evidence of its influence. Even at its smoothest, when the surface is generally unbroken, a deep undertone presents itself, of which the origin is not visible, but which is largely due to the action of the sea in contact with the rocks and caves beneath. When rough the sea makes itself heard several miles inland.

Among the characters of this coast which are presented to the unscientific observer, it may be mentioned that the general impression is of abundance of light, notwithstanding that cloud is also plentiful. Whatever be the influence which causes sunburn it is here powerful.

The country between the backbone and the Atlantic, consisting of high tableland and steep slopes towards the sea, has a generally bare appearance with little vegetation at any height from the ground, though the surface is, as a rule, cultivated successfully. This receives a certain amount of protection from the wind by means of high stone "hedges"; it generally consists of pasture, though there is an admixture of arable, more particularly in the neighbourhood of Newquay. In contrast with the general bareness are occasional hollows and deep gorges, or chines, where the shelter is fairly complete, and where trees and underwood flourish even to luxuriance. In some of the hollows ferns grow in profusion. Masses of the *Osmunda regalis* are to be found near Trebarwith in abundance and magnificence in deep hollows between the hills, and maidenhair is occasionally to be seen in caves and recesses on the coast in the same neighbourhood. These facts are mentioned in testimony of the warmth and moisture of the air in sheltered spots, and of the richness of vegetation in such places, in contrast with the general aspect of the vicinity of the north coast, which is bare as regards trees, though the surface itself is not unproductive. These characters, which are much

marked about Tintagel and the Land's End, are much modified in some places, notably about Newquay. The vale of Lanherne in this district, two or three miles inland, is luxuriantly wooded; the woods of Carnanton in this neighbourhood are nearly as luxuriant as those in some of the richer parts of South Devon. The temperature of the air on the coast and its humidity, though less than on the south coast, would appear to be such as to encourage vegetation, though this is kept down where the influence of wind and sea are paramount. In a most exposed position about three miles from the Land's End, and 300 feet above the sea, an enterprising gardener, Mr. Boddy, has erected a range of glass houses in which grapes are cultivated with great success and sent to other parts of the country. He assures me that though a little artificial heat is employed when these are wanted abnormally early, yet the fruit usually attains ripeness and perfection without any such help. The narcissus is grown in the open at the same place, and exported in competition with the Scilly Islands.

If we now cross the county to the south and east, so different a scene presents itself that it is not easy to realise that the distance is so short. If we travel from Sennen on the west, or from the north coast about St. Ives, to Penzance on the south, a distance in either case not amounting to ten miles in a straight line, we exchange comparative barrenness for extreme luxuriance and fertility. The southern slopes and valleys of the Cornish coast—not speaking for the present of the Lizard, which is in some respects peculiar—are richly beset with forest trees, and there are numerous highly cultivated gardens with many exotics, which flourish without protection in the open air and habitually survive the winter. Myrtles grow luxuriantly. Geraniums and fuchsias are very common, and attain the dimensions of large shrubs. About Penzance aloes flourish and flower. In the same district and about Falmouth bamboos grow in the open. The citron ripens in the open near Falmouth, though I cannot learn that either oranges or lemons do so on this coast without artificial warmth. Sir E. Sieveking tells us that palms flourish and endure the winter at Falmouth, though I have not observed, and cannot learn, that they do so at Penzance. The neighbourhood of Penzance is famous for the production of early vegetables, in which it competes with the Scilly Islands. Large quantities of potatoes,



broccoli, Brussels sprouts, and peas grown in open air are sent to London and elsewhere during the months of January, February, and March.

Enough has been said to indicate the striking contrast in general appearance and in vegetation, which is important evidence of climatic difference, between the south coast and the north; and the difference is no less apparent in its effect upon the sensations. In crossing the short distance which separates these coasts, possibly not more than ten miles, we exchange the bracing character of the north-west for one producing limpness and depression, and indisposing the traveller for exertion to which before he was incited by the influences around him.

**Sketch of the Geology.**—The geological formations which Cornwall presents are chiefly sandstones, slates, granite, and serpentine, with the addition of accumulations of sand on parts of the northern coast. Calcareous matter is sparingly met with; chalk is totally absent, and limestone nearly so; whence there is little opportunity for impregnation of the water by lime; in most parts of the county numerous springs reach the surface from the subjacent rock and pour forth abundant and unfailing supplies of soft, clear, and pure water.<sup>1</sup> The infrequency of calculous disorders is probably due to the character of the water. The surface is generally dry, notwithstanding the amount of rain which falls. The subjacent rocks are but thinly covered with soil; the rocks themselves are in some instances like the sand, extremely pervious, but more often like the slate and granite, nearly impenetrable by water, and presenting sloping surfaces, off which it readily runs. In connection with the granite formation, particularly about Rough Tor, there are some bogs like those on Dartmoor; but these are of no great extent, and form no considerable exception to the general dryness of the surface.

It is not necessary for the purpose in view to describe the strata or the mineral products at any length. Beginning at the north-eastern end of the county, where it impinges upon Devonshire, a large tract of carboniferous sandstone extends from this boundary

<sup>1</sup> As one exception to this statement I may mention a spring at Bossiney, probably in connection with the belt of limestone referred to at p. 8, where the water is so loaded with calcareous matter as to deposit an incrustation, chiefly consisting of carbonate of lime, upon the moss over which it flows.



to Boscastle, and stretches inland so as to cover the greater part of the width of the county in this situation. A narrow strip of limestone stretches inland from Boscastle, reaches Launceston, and skirts the northern edge of Dartmoor.<sup>1</sup> At Boscastle the Devonian beds, consisting of sandstone and slate, present themselves and cover the greater part and almost the entire width of the county, extending as far west as St. Ives. The slate which thus covers a large part of the county is extensively quarried. It forms much of the high central land and the steep seaward slopes, and constitutes the imposing and indestructible cliffs which characterise the coast from Boscastle to St. Ives. Several isolated regions of granite, generally of greater elevation than the surrounding country, present themselves in the midst of the Devonian strata and form the moorlands and mountains already adverted to. Beside these isolated granite highlands, the same rock constitutes, with only some small intrusions of greenstone, the whole of the peninsula of the Land's End, which extends from St. Ives on the north and from near Penzance on the south to the western extremity, or Land's End proper. The granite here attains a general elevation of 300 or 400 feet, occasionally reaching that of 700, and imparts the bareness which commonly belongs to this formation. This high level country presents to the Atlantic an irregular circuit of striking cliffs, which comprise what is generally reckoned as the finest coast-scenery in England. They are of great height and are richly coloured with lichens. They are weather-worn and fantastic in outline, and have a character of castellation with many turrets and pinnacles which overlook the sea, and to a certain extent the land also. This configuration, together with the rectangular cleavage of the granite of which the cliffs consist, suggests the idea of gigantic and ruinous masonry.

Passing southwards, we next come to the promontory of the Lizard and its mass of serpentine, which, together with an allied rock, diallage, occupies its southern and greater extent. The surface of the serpentine is generally elevated and consists of moorland and bog, rich in certain kinds of vegetation interesting to the botanist but nearly useless to the farmer. The sea cliffs which bound it are often of great height; they present irregular and picturesque outlines and various and vivid colours. At the

<sup>1</sup> Ramsay's Geological Map of England.

extreme end of the peninsula, and also in other parts of it, are comparatively small regions of hornblende slate, which is as remarkable for its fertility as the serpentine is for the contrary.

It is not necessary to mention anything further in this brief sketch of the geology of the mainland excepting a mass of limestone, a rare formation in this county, which lies on the southern coast-line opposite Verryan Bay, and measures about ten miles by three. The Scilly Isles are masses of granite similar to that which forms the Land's End, but of much less elevation. St. Michael's Mount, a small island off Marazion, with which it is connected by a causeway, also consists of granite.

**Climatology.**—Before proceeding to local detail, it may be said that the mainland of Cornwall is the warmest and most equable in climate of the counties of Great Britain. The eight stations from which particulars are annexed give a mean temperature for the year of 50·1. The mean temperature of London is 49·2. It is at once apparent that this trifling difference does not express the peculiarity of the Cornish climate. For the purposes of the physician it is sufficiently evident that the mean temperature is almost insignificant. The question is rather what is the temperature in winter and what in summer, than what is the mean between the two. The chief character of the Cornish climate is its equability as regards the course of the whole year and of each day; it is neither so hot nor so cold as other places the mean of which is not very different. Taking the three winter months January, February and March, and the average of the eight mainland stations, the mean temperature is 42·6. The mean temperature of London as recorded at the Regent's Park for the same three months is 39·7.

But even this does not represent fully the advantage in temperature which Cornwall possesses, for we have to take into account the small amount of daily variation which is here presented. The lowest daily temperature in Cornwall for these months gives an average of 37·0, that of London is 34·3. Taking for comparison Buxton as an exceptionally cold place, the mean minimum here for the same three months is only 30·0. In the lowest temperature of each winter's day the dweller in Cornwall has an advantage of 2·7 degrees over the Londoner and 7 degrees over the inhabitant of Buxton.



The daily range throughout the year is striking in its smallness, giving an average of 10·8 for the seven mainland stations from which the detail was obtainable. The daily range at Norwood is 14·1. In addition to these facts showing the range of temperature within each day, I may state others which tell in the same direction relating to the variation between one day and another.<sup>1</sup> Mr. Scott, of the Meteorological Office, has shown that the parts of the British Isles in which there is the least daily variation are Cornwall and the west of Ireland as represented by Falmouth and Valencia Island. The daily variation, in other words the average difference in the mean temperature, between one day and the next is at Falmouth and Valencia Island only 1·9. At Kew it is 2·5, at Aberdeen 2·4 at St. Petersburg 4·0. The only place for which a more uniform temperature has as yet been published is Georgetown, Demerara, where the variation is 1·1. It is certain that if we had the means of making the comparison, the Scilly Islands would be found to be even more equable than Falmouth.

The rainfall in Cornwall is great; the eight mainland stations give an average of 38·9 inches for the year. To speak broadly, the rainfall varies from 30 inches at Hayle to 50 at Bodmin, with a general average for the county of 39. The rainfall is thus much above the average for England. Margate gives 23 inches, London 25.<sup>2</sup> Bodmin must be regarded as one of the most rainy places in England, though the rainfall of other parts of Cornwall is exceeded by that of certain other places. It is worthy of special remark that the humidity of Cornwall is not so great as a casual observer might infer from the amount of rain. Putting aside the record at Bude as untrustworthy, the average mean humidity so far as the records go, is only 83, greater indeed than

<sup>1</sup> Notes on the Climate of the British Isles, by Robert H. Scott. *Longman's Magazine* for June, 1892.

<sup>2</sup> Since this report was written, an interesting statement has been published relating to the rainfall at Altarnun, which appears to be one of the most rainy places in the county. Altarnun lies between Launceston and Camelford, on the edge of the moor which surrounds Brown Willy, at an altitude of 600 feet. The record to which I refer gives the rainfall at Altarnun Vicarage, estimated by daily observations made by three successive vicars, carried on for a period of thirty years, from 1864 to 1893. Rain fell on an average in 215 days in the year, with a yearly average of 60·5 inches.—*Launceston Weekly News*, May 19th, 1894.

that of London, equal to that of Worthing and Portsmouth, less than that of Weston-super-Mare, Ilfracombe, Sidmouth, and many other places where the rainfall is less. It is obvious, as has been pointed out by Mr. Bayard, that the rainfall and the humidity vary independently. The general dryness of the surface in Cornwall and the absence of such mists as arise from it must have influence in this relation. The Cornish mists are usually from the sea, and only occasional.

**Sunshine.**—With regard to sunshine, the records I have hitherto chiefly relied upon give me no information excepting in the case of Falmouth. This station is in connection with the Meteorological Office, and forms one of a large number of points of observation, upon which that office has based a report entitled *Ten Years' Sunshine in the British Isles*. The observations were, with two exceptions, made with the Campbell-Stokes sunshine recorder, which registers the *sunheat*, not the *sunlight*. On the basis of ten years Falmouth presents itself as having more sunshine than any place except Jersey. If, however, we accept the evidence of five years only, which enables us to include St. Leonard's and Ventnor, it appears that St. Leonard's is the equal of Falmouth in this respect, Ventnor only slightly inferior. I annex a table compiled from the report already referred to, showing the five years' record of sunshine at Falmouth in comparison with some other places stated for the whole year and also for the five cold months.

Thus Falmouth, to say the least, is one of the most sunny places in England, and we may probably extend this inference to some other parts of the county from which we have no records. It must be presumed that the Lizard from the prevalence of sea fogs has less sun than Falmouth, and it is probable that the Land's End may be similarly obscured though to a less extent.

Penzance, standing between the two, probably has more mist than Falmouth, though on this point certain information is much to be desired. With regard to the north coast the abundance of light is evident to the ordinary observer, but here again accurate observations are wanting. In the Scilly Islands, exposed as they are to the mists of the Atlantic, the general impression is of gray skies and misty air, but we have nothing more definite to go upon.



As between the north and south coast the meteorological stations which should enable us to compare them are few, and even of these the records are not always complete, so that it is necessary to supplement instrumental observations by personal impressions. If we take Penzance, Falmouth, and Maker as representing the south coast, and Bude and Hayle the north, we find that the south coast has a mean temperature for the whole year of  $50.3^{\circ}$ ; the north coast one of  $49.5^{\circ}$ . Taking only the cold months—December, January, February, and March—the south coast gives a

PERCENTAGE OF BRIGHT SUNSHINE FOR THE FIVE YEARS, 1886—1890.

	Fal- mouth.	Jersey.	Ply- mouth.	South- bourne.	Ventnor.	St. Leonard's.	Bunhill Row, London.
January . . . .	20	28	19	22	22	25	5
February . . . .	30	29	32	27	29	29	10
March . . . . .	32	38	33	25	33	31	13
April . . . . .	43	44	42	33	43	38	26
May . . . . .	45	49	43	41	42	47	32
June . . . . .	47	48	43	41	37	45	34
July . . . . .	42	46	38	40	39	43	31
August . . . . .	47	54	44	44	47	45	36
September . . . .	38	50	40	35	48	45	29
October . . . . .	36	38	32	33	40	39	21
November . . . .	27	23	23	21	20	22	7
December . . . .	25	28	25	24	21	27	2
Mean for whole yr.	36	39	34	32	35	36	20
Mean for 5 mths. } Nov. to March. }	26	29	26	23	25	26	7

mean temperature of  $42.9^{\circ}$ ; the north coast one of  $42.2^{\circ}$ . Thus the north coast may be taken as about  $1^{\circ}$  colder than the south, a smaller difference than might be supposed; but it is accentuated by the greater daily range on the north coast, which is  $12.0^{\circ}$ ; while that on the south coast is  $8.9^{\circ}$ . The daily lowest temperature on the north coast, taking the same stations, is  $42^{\circ}$ , that on the south coast  $46^{\circ}$ , so that on an average the lowest temperature of each day is  $4^{\circ}$  lower on the north coast than the south.

The rainfall on the south coast is greater than on the north, though nowhere so great as in the central part of the county as represented by Bodmin. The smallest amount of rain is at Hayle,



with 29 inches. It may be taken as a matter of common experience that less rain falls on the north coast of Cornwall than on the south, and particularly in the central parts. With regard to the humidity of the air, the ordinary observer would infer with confidence that the north coast is less humid than the south and central districts; observations, however, are wanting on the north coast.

As to wind, this in direction is much the same all over the county, including Scilly. Winds from the north and south are equally common; those from the west are more prevalent than from the east at every place, and, with scarcely an exception, at every season. The strength of the winds has not been generally recorded. It is reported, and may well be believed, that the westerly gales have extreme violence at Scilly, while the winds from the east are also severely felt. The winds from the west and north strike with great violence upon the north coast, while those from the east are there considerably modified, both in force and character. Some parts of the south coast suffer exceptionally from the east winds. I have been informed by inhabitants that these are much felt at the Lizard, which is high and unprotected both from the east and west.

**Temperature of the Sea.**—For the present purpose the temperature of the sea off Cornwall is of interest only so far as it modifies that of the air, but a few facts may be given as of interest in this relation. Considering the Gulf Stream as impinging on the west coast of England, the temperature of the Channel between the Land's End and the North Foreland varies less than might have been expected. The sea off this Foreland in December, as observed at the Goodwin Lightship, is only  $1^{\circ}$  colder than that off Falmouth. In the North Sea the loss of temperature becomes more declared, but from the nearly uniform warmth of the Channel in winter, from the Land's End to the Goodwin Sands, it is to be inferred that the influence of the Gulf Stream is by no means confined to Cornwall or even to the west of England.

In the late autumn and winter the sea about Cornwall, as very generally elsewhere, is warmer than the adjacent air. Between April and September there is generally a slight depression in the other direction. In Scilly the greatest difference between the sea

and air is attained in December, with a temperature of  $51^{\circ}$  for the sea,  $47^{\circ}$  for the air. With regard to the mainland of Cornwall, the greatest difference is also reached in December, with an average temperature of  $49^{\circ}$  for the sea,  $44^{\circ}$  for the air. The place where the sea is absolutely the warmest in December is on the north coast between Padstowe and St. Ives, where the sea is no less than  $7^{\circ}$  warmer than the neighbouring air. The sea here, for a limited space, gives a higher temperature at this time than that off any other part of the United Kingdom, not excepting the Scilly Islands. The temperature of the water at this place is  $52^{\circ}$ , that off Scilly is  $51^{\circ}$ , that off Falmouth  $50^{\circ}$ , that off Margate  $49^{\circ}$ , that off Yarmouth  $41^{\circ}$ . Probably some offshoot of the Gulf Stream is especially directed to this spot, and cannot but have influence in modifying the climate of Newquay. It has already been noted that Calabar beans are occasionally washed ashore in this neighbourhood. The warmth of the sea at this spot is in remarkable contrast with the coldness of the upper part of the Bristol Channel, which in the same month registers  $10^{\circ}$  lower. This is cooled by the waters of the Severn, and presents the low winter temperature common to estuaries.<sup>1</sup> It is worth noting, as bearing generally on the comparative influence of the north and south coasts of Cornwall, that the sea in winter is on an average as warm off the north coast as off the south. There are three points of observation off the north coast, only one off the south; the latter, near Falmouth, gives  $48^{\circ}$  as the mean temperature of the sea for the five months from November to March inclusive. The three stations off the north coast, taken together, give a mean temperature for the same period also of  $48^{\circ}$ . The mean temperature off Ramsgate for the same period is  $47^{\circ}$ ; that off Yarmouth,  $41^{\circ}$ .

#### GENERAL CHARACTERS OF SEVERAL TOWNS AND DISTRICTS TAKEN SEPARATELY.

The climatic influence of Cornwall must receive some consideration with reference to separate towns and districts, though it will not be necessary to repeat the general statements which

<sup>1</sup> The sea temperatures here referred to are taken from the Meteorological Atlas.



have been made. It will be enough to consider in brief detail a few of the places which have, or are likely to acquire, importance as health resorts. On the south are Penzance, Marazion, Falmouth and Fowey, while the Lizard may claim a brief mention. On the north coast are Bude, Tintagel, Padstowe, Newquay and St. Ives. The Scilly Islands will receive separate consideration in all respects.

Penzance and Marazion lie about three miles apart on the shore of Mount's Bay. Penzance looks south-east, Marazion south. Penzance is sheltered from the overbearing west wind by the high country about the Land's End and very completely from the north by elevations of from 500 to 700 feet within four miles. It is exposed to the east, though the promontory of the Lizard affords some distant and ineffectual protection in this direction, and more complete protection can be obtained by choice of residence and place of exercise. Marazion does not front the east but is enfiladed by it. On the other hand it is less sheltered from the north, the land between Marazion and St. Ives Bay to the north-west being comparatively low. Allowing for the difference of exposure, what is to be said about Penzance may apply also to Marazion. In England the lines of equal temperature run north and south; to find warmth we must travel westward. Penzance as the most westerly place is also the warmest in winter. Notwithstanding the incomplete protection from the east, in which Penzance compares unfavourably with Torquay and certain other places, yet Penzance appears to be warmer in the winter than any other place on the mainland of England from which we have records. Penzance for the three winter months gives a mean temperature of  $43^{\circ}$ ; while the mean of the lowest is  $40^{\circ}$ . This shows an advantage over Torquay of  $2^{\circ}$  in the mean, of  $4^{\circ}$  in the mean minimum. Over Ventnor, Penzance has an advantage of  $1^{\circ}$  in the mean temperature of winter; of  $3^{\circ}$  in the mean minimum. It is a matter of regret that we have no record of the humidity of Penzance.<sup>1</sup> The records at Falmouth are exceptionally accurate and complete, and may to a certain

<sup>1</sup> The meteorological tables referred to in this report give no information with regard to the humidity of Penzance, which it is of especial interest to compare with that of Falmouth and other places. The County Council of Cornwall are about to supply the deficiency in the course of observations which they have initiated in many

extent be used to supplement those at Penzance. The neighbourhood of Penzance is attractive, St. Michael's Mount gives variety to the sea-view, while there are many points of interest in the adjacent district of the Land's End, as well as bracing air should the dweller in Penzance require this change.

Falmouth, only twenty-five miles from Penzance, may almost be considered in common with it. The mean temperature for the year is  $50.1^{\circ}$  at Falmouth, against  $50.7^{\circ}$  at Penzance. Falmouth is slightly less equable with a mean daily range of  $8.5^{\circ}$  against  $7.8^{\circ}$  at Penzance. The exposure of the town is less advantageous than that of Penzance, the sea-front of Falmouth looking north-east, and not on the open sea, but upon an arm. Falmouth is protected from the west by heights of 500 feet within four miles, but less effectually from the north, and very imperfectly from the east, on which side only a small neighbouring promontory of no great height intervenes between the town and the Channel. There is a small village named Flushing on the opposite side of the arm of the sea on which Falmouth lies; this looks west, is sheltered on all sides, and is reputed to be the warmest place in Cornwall, not speaking of course of the Scilly Islands. The relative humidity of Falmouth is not high, being only  $82^{\circ}$ —no more than that of Ramsgate and much less than that of Ilfracombe—but it conveys to the senses an impression of relaxation like that experienced at Penzance. That this impression is not due only to humidity is evident; probably the low level of Falmouth, little above that of the sea, is also concerned. The neighbourhood of Falmouth is less attractive than that of Penzance.

#### FOWEY.

Fowey, once one of the most important ports in the kingdom, now fallen from its high estate, is situated near the mouth of the

parts of the county, and cannot fail, if continued and supervised, to furnish information of great use to invalids and their advisers. I have before me monthly records which enable me to compare Penzance and Falmouth for the nine months from December 1893, to August 1894. According to these the relative humidity for this time averaged  $88^{\circ}$  at Penzance,  $82^{\circ}$  at Falmouth. The time is short, and the system probably not yet perfect, but the figures may be taken for what they are worth. Should further observations present a similar difference, the fact will be of practical importance.



river of the same name, upon its western shore. The river is a considerable one, and brings down a large volume of inland water which cannot fail in winter to lower the temperature at the mouth. Fowey, built along the river bank, looks east by south, and has much protection to the eastward by means of the high land opposite, which ascends to 400 feet within about four miles of the town. There are no climatic records from Fowey, but from the report of patients who have been there in winter I learn that it is thought to be colder than Penzance, notwithstanding that the protection from the east seems to be more complete. It will be noted that Fowey is about half-way between Penzance and Torquay, and it is probable that climatically also it occupies an intermediate position. The hotels are on high ground and somewhat exposed; much of the town is more sheltered. The neighbourhood is less interesting than that of Penzance. The situation of Fowey upon a river is a disadvantage; and if in any case it should be preferred to the more western resorts it would probably be not simply for medical or climatological reasons. There is plenty of boating.

#### THE LIZARD.

The Lizard can scarcely be regarded as a health resort; full of interest as it is to the artist, the botanist and the tourist, it has few attractions to the invalid, and certainly none in winter. The peninsula mainly consists of tableland or undulating country varying from 200 to 350 feet in height, exposed to every wind, notably to the east, without mitigation; the winds from this quarter are much felt, according to the testimony of the inhabitants, especially in spring. The Lizard town, the metropolis of the district, is a mean and unattractive village about a mile from the southern extremity, within easy reach of two lines of coast of great beauty and diversity. The serpentine cliffs are unequalled in colour, and some persons think that the finest coast scenery in Cornwall is here. The town is about 250 feet above the sea on a bare, dry, and exposed promontory. Its high level, free exposure, and the character of the soil, give it a more bracing character than probably any other part of the south of Cornwall; but the want of protection from the east wind makes it unfit for a winter resort, while the prevalence of sea-fogs is an objection at all times excepting to those persons who are interested in wrecks, which



furnish the chief excitement of this coast. The Lizard may be regarded as a bracing, healthy, and interesting resort for the summer and early autumn, but is not suited for invalids in the winter and early spring.

The general description which has been given of the north coast of Cornwall will render it unnecessary to dwell at length on each particular place. The advantages of the north coast as a resort in summer and autumn, whether for holiday or health, need no insistence. In the late autumn, even up to Christmas, there is little cold though much wind; and it may well be taken into consideration whether the bracing quality of the north coast is not often a greater advantage than the slightly higher temperature and greater shelter from the north wind provided by the south coast. As regards the east wind the north coast has a distinct advantage.

#### NEWQUAY.

As a health resort on the north coast, the greatest importance and perhaps the greatest promise attach to Newquay. This is a modern town connected with a harbour, and the remains of an old fishing village. The town is placed on the sea front of a promontory, with a general northern aspect; it derives some protection from the east by rolling uplands with a general elevation of about 200 feet; it is somewhat sheltered from the south and west by the narrow promontory on part of which it stands. It is to be regretted that we have no records of the temperature of the air at Newquay, but it is undoubtedly warmer than the more northerly parts of the coast, notably Tintagel and Bude. The exceptional warmth of the sea in this position, especially in the month of December, must be taken into consideration as probably modifying its winter climate. Newquay lies in a considerable bay, of which Towan Head forms the western corner, and constitutes a natural breakwater, in virtue of which the recess on which the town stands is comparatively smooth, and has facilities for boating and bathing unequalled on this coast. There are abundant sands under the cliffs on which the greater part of the town is built; these sands, with some interruptions from inlets and promontories, extend northward for about four miles; for the most part they are completely covered at high tide, widely exposed at low. The

level sands, the lofty cliffs, the detached rocks which the tide converts into islands, and the caverns which it exposes, combine together to make coast, or rather shore, scenery which is scarcely to be surpassed, and is surpassed only in certain particulars by Bedruthen and Kynance. The coast to the southward also has especial beauty and interest, in the rocky promontories and deep sandy inlets, but enough has been said to show that an invalid who is conscious of natural beauty will have many inducements to frequent the sands. Newquay has hitherto been used more as a holiday resort in summer and autumn than a health-resort in winter. As a fairly cool and moderately bracing place for summer and autumn, the climate is all that can be desired. Even in late autumn and up to Christmas, it is comparatively warm; as a winter resort, it is seldom selected, and we have little experience of it as such. Probably to many invalids the exposure, especially to the north wind, would be an objection, but to others the bracing character of the climate together with the absence of severe cold and general equability would make it more eligible as a permanent residence than the more relaxing districts on the south coast.

#### ST. IVES.

Another place on the same coast which may possibly in future take rank as a perennial resort is St. Ives. St. Ives is a port and fishing town of much antiquity and little modern enlightenment. The narrow streets are ill-smelling, and the vicinity of the harbour especially so. The town itself can scarcely be recommended, whatever may be said of spots in the vicinity. One of these is the Tregenna Castle Hotel, an old manor house about half a mile from the town which stands in its own grounds, and possesses the sanitary advantages in which St. Ives is too obviously deficient. St. Ives, like Newquay, occupies the western corner of a bay. It looks chiefly to the east, and is much sheltered from the west. St. Ives seems to deserve more consideration as a health resort than it has yet received, though before it comes to be so regarded much needs to be done. This town probably even more fully than Newquay combines the mitigation of cold with a northern aspect. It is the most westerly as well as the most southerly town of consideration on the north coast of the English



mainland. Those who benefit by the bracing effect of the north wind may find it here deprived of some of its malevolence. Near as is St. Ives to Penzance the climate is notably less depressing. The mean minimum of the air at Hayle from January to March is  $39^{\circ}$ , that at Penzance  $40.2^{\circ}$ . The daily range at Hayle for the same period is  $8.6^{\circ}$ , that at Penzance  $6^{\circ}$ . For a place of northern exposure, Hayle, which may be taken as standing good for St. Ives, is in winter warm and equable beyond any other place with a similar aspect of which we have record.

#### PADSTOWE.

I have received from Mr. Marley, of Padstowe, a minute and valuable description of the place, but it is enough for the present purpose to say that Padstowe is a small not very attractive seaport on the west side of the broad estuary of the Camel, more concerned with maritime trade than resorted to for health or pleasure. It is open to the east and to the estuary; protected by low hills from the west. Mr. Marley dwells on the mildness of the climate, on the many exotics which flourish there during the winter, on the small amount of snow which falls, and the quickness with which it disappears. But the exposure of the town to the east, and its position upon an estuary, place it at a disadvantage as compared with some other places on the Cornish coast. On the eastern side of the river is a large extent of deep sand upon which some small villages or hamlets are placed, notably one called Rock, which is opposite to Padstowe, separated from it by the estuary. This village is open to the west, protected from the east by high land, and somewhat sheltered from the north. I am informed that it is exceptionally warm when the east winds of spring are severely felt on neighbouring parts of the coast. The deep sand on which it stands must make it dry and it would seem that as far as natural advantages are concerned, the place is better situated as a winter residence than most others on the north coast of the county. It consists at present only of an inn and a few small houses. It is reported to be extremely healthy, and it is possible that future enterprise may convert it into a winter resort for those who are contented with physical surroundings conducive to health irrespective of social interests. The neighbourhood is thinly inhabited and on the landward side comparatively uninteresting.

To the seaward there is a grand headland and a great extent of sand-hill; Mr. Marley thus speaks of Rock: "The general warmth of its climate is almost if not quite equal to the south of France, and the severity of our English winter, and the bleakness of the easterly and northerly winds are entirely unfelt there, as the houses are built near the edge of the estuary facing the south, and are sheltered on every other side by high hills——, at Pentire Head, 256 feet high, and one of the boldest and highest headlands of the north coast, two miles distant, all the advantages and pleasant sensations of the keen, clear, and strong sea-air are experienced."

#### BUDE.

Bude is a small modern watering-place on the northern part of the north coast, where it looks straight to the west, and from the high cliffs of which a great expanse of the unbroken Atlantic is to be seen. It has a canal, a haven, a little river and a little trade. It lies in a valley leading down to the sea largely filled with deep blown sand on which most of the residences are built. The lines of houses mostly face north and south, being at right angles to the sea-front; some houses which stand on the northern side of the estuary and look due south would seem not unsuited for the winter. The place is considerably sheltered from the east by the high land which connects Devon and Cornwall and rises to over 400 feet within four miles of the town. The deep sand on which Bude is mostly situated should make it dry and so far desirable; the records of humidity cannot be cited, but it is generally believed that Bude is drier and more free from fog than most parts of the county. While the mean temperature for the year (as will be seen by the annexed records) is only one degree below that of Hayle, near St. Ives, Bude is far less uniform: warmer in summer and colder in winter. For the months from January to March, the mean daily minimum at Bude is  $36.2^{\circ}$ , that at Hayle  $39^{\circ}$ . As a winter resort Bude is disadvantageous as compared with St. Ives, and probably with Newquay. As an autumn resort it has much to recommend it, though the beauty of the coast will not compare with that at Tintagel and Newquay. The cliffs are imposing, the air is exceptionally bracing; dry, breezy and unenclosed downs give pleasant opportunities for walking.



## PART II

THERAPEUTICAL AND PATHOLOGICAL INFLUENCES OF CORNWALL  
AS A WHOLE, AND OF SEVERAL PLACES SEPARATELY.

THE therapeutical and pathological influences of the climate of Cornwall, taking the county as a whole, are displayed in the following tables of which the particulars have been extracted or deduced from the Reports of the Registrar-General. The first table is constructed by putting together the ten annual reports from 1880 to 1889 inclusive; covering the exact period of the climatological observations. In the second table I have taken advantage of the decennial summary of the Registrar-General, the last available relating to the ten years from 1871 to 1880. The basis of both tables is the relation of mortality to the number of persons living though not expressed in the same terms. The second table shows that deaths from diseases of the respiratory organs occur in a smaller proportion in Cornwall than in England collectively; deaths from phthisis in a somewhat larger proportion. Reference to the first table shows that bronchitis and pneumonia are in a smaller ratio in Cornwall than in England collectively. Taking phthisis in particular, the frequency of this disease varies much throughout the county. On the north coast generally the mortality from phthisis is low, though there are parts of England, notably some rural districts, where it is lower still. Camelford and Launceston give the lowest proportion, Helston and Redruth the highest. The two former include much high, breezy, and sparsely populated country; Helston is exceedingly humid; Redruth is largely a mining centre. Falmouth shows a low proportion of phthisis notwithstanding that it is much resorted to by phthisical persons, and Penzance, still more thus resorted to, gives perhaps a lower proportion than might thence be expected—lower than many other parts of Cornwall and of England not put to the same purpose. As regards the mortality from phthisis in some parts of Cornwall, the influence of occupation is to be borne in mind. It is known that this disease is especially frequent

## MORTALITY FROM CERTAIN DISEASES

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TABLE I

DEATHS FROM VARIOUS CAUSES IN RELATION TO POPULATION.

Mean of 10 years from 1880 to 1889.

*One Death per annum to number of persons living.*

	ALL ENGLAND. 1 to — persons.	CORNWALL. 1 to — persons.
Rheumatism <sup>1</sup> . . . . .	7,855	7,305
Bronchitis . . . . .	473	553
Pneumonia . . . . .	984	1,107
Pleurisy . . . . .	18,714	18,477
Acute Nephritis . . . . .	22,481	33,900
Bright's Disease . . . . .	4,401	5,149
Diabetes . . . . .	18,461	15,706
Calculus (urinary) . . . . .	113,058	314,122

TABLE II

ANNUAL DEATH RATE PER 1,000 PERSONS. 1871—1880.

	Scarlet Fever.	Diphtheria.	Enteric Fever.	Diarrhoea and Dysentery.	Cancer.	Scrofula.	Phthisis.	Diseases of Respiratory Organs.	Urinary Organs.
England and Wales . . . .	·72	·12	·32	·91	·47	·13	2·12	3·76	·39
Whole of Cornwall . . . .	·59	·13	·34	·52	·51	·13	2·20	2·84	·37
North Coast of Cornwall:—									
Stratton . . . . .	·24	·12	·16	·25	·72	·08	2·00	2·52	·54
Camelford . . . . .	·24	·17	·35	·44	·42	·26	1·64	1·80	·25
St. Columb . . . . .	·18	·25	·40	·34	·27	·10	1·91	2·56	·28
Central Cornwall:—									
Lanncoston . . . . .	·35	·36	·20	·30	·57	·14	1·72	3·40	·54
Liskeard . . . . .	·30	·10	·32	·31	·51	·11	1·90	2·85	·43
Bodmin . . . . .	·58	·16	·30	·26	·54	·12	2·26	2·85	·44
Redruth . . . . .	1·09	·14	·33	·61	·66	·11	2·48	2·97	·38
South Coast of Cornwall:—									
St. Germans . . . . .	·23	·14	·48	·59	·60	·10	1·92	2·86	·40
St. Austell . . . . .	·85	·14	·35	·41	·46	·12	2·33	2·87	·45
Falmouth . . . . .	·70	·08	·28	·71	·47	·09	1·92	2·95	·30
Truro . . . . .	·45	·14	·39	·45	·49	·14	2·25	2·68	·27
Helston . . . . .	·57	·05	·26	·34	·42	·11	2·80	2·84	·20
Penzance . . . . .	·66	·09	·41	·93	·50	·18	2·24	2·91	·38
Scilly Islands . . . . .	·09	·09	—	·59	·45	·14	1·95	1·59	·50

<sup>1</sup> This includes deaths entered under the two headings "Rheumatic Fever, Rheumatism of Heart," and "Rheumatism."



among miners, among Cornish miners more than any others. Dr. William Ogle has brought out this fact numerically, and shown the striking difference in the mortality from phthisis and diseases of the respiratory organs<sup>1</sup> between miners and fishermen. If we could deduct from the Cornish deaths from phthisis those which were due to occupation we should have much lower numbers than we have presented.

It is evident on every showing that both acute and chronic forms of albuminuria are in Cornwall far below the general average. I have elsewhere shown<sup>2</sup> that this corresponds with equability of climate. Diabetes, on the other hand, occurs in a greater ratio than in all England taken together, though certain counties, notably those which are more purely agricultural, present this disease with greater comparative frequency than does Cornwall. At present it would be premature to assign any reason for the inequality<sup>3</sup> in the distribution of this disease. With regard to urinary calculus there is less difficulty. The remarkable infrequency of stone in Cornwall may, with probability, be associated with the general absence of calcareous rocks, and the general softness of the water. Rheumatism is comparatively frequent, which may reasonably be connected with the amount of rain and the general humidity of the air.

Zymotic disease, contrary to what might have been expected, is less prevalent in Cornwall than in England and Wales generally. There is less scarlet fever, much less diarrhoea, practically the same proportion of enteric fever and diphtheria. The villages and small towns of Cornwall are remarkable for the absence or simplicity of their sanitary arrangements. In some, particularly the fishing villages, the odours are disgusting and complex, and the ubiquity of drainage such as to afford every facility for the dissemination of typhoid and other diseases—it sometimes happens accordingly that cholera or typhoid will prevail with intensity in a limited area.

In 1849,<sup>4</sup> Antony (near St. Germans), Mevagissy, and several other villages suffered intensely from cholera; and of more recent date typhoid has been known to break out and prevail in some

<sup>1</sup> *Supplement to the Forty-Fifth Annual Report of the Registrar-General*, p. 58.

<sup>2</sup> *Albuminuria*, 2nd edition, p. 335.

<sup>3</sup> *Diabetes*, p. 70.

<sup>4</sup> *Reports on Epidemic Cholera*, p. 262.



village which is usually quite free from it. The Cornish villagers, like too many others, are culpably indifferent to infection even in the shape of scarlet fever, so whenever this presents itself every facility is given for its spread. But notwithstanding all this there is comparatively little disease of the zymotic class. The population is scattered and the groups isolated; high winds and pure air are largely provided, and the drinking water is very frequently obtained directly from some natural spring out of the reach of contamination. The general impression is that the Cornish villages are mostly free from zymotic disease, though when an outbreak presents itself it is apt to be intense.

#### PENZANCE.

We may conclude from the facts which have been adduced that Penzance is on the whole the part of the mainland of Great Britain where there is, not the greatest heat, but the greatest absence of cold; against this advantage is to be placed the amount of rain and the considerable (though unmeasured) humidity of the air.<sup>1</sup> It would be presumed from these facts that inflammatory diseases of the respiratory organs would be in abeyance, whatever else might be the influence of the climate. This appears to be so. Table II. shows that the total deaths from diseases of the respiratory organs in the Registration District of Penzance (which includes St. Ives and the Land's End) are much below the average, while those from phthisis are somewhat above. With regard to phthisis, much allowance must be made for the number of cases which are attracted to Penzance from elsewhere. I am enabled by the kindness of Dr. Montgomerie, of Penzance, to supply some evidence with regard to what may be called the *inherent* proportion of phthisis, and of other diseases in this locality. Dr. Montgomerie has provided details which have enabled me to sum up the proportions of different diseases among dispensary patients at Penzance. Such patients it may be presumed are not visitors, but permanent residents, and present the influences of Penzance rather than of distant places. These particulars must be compared with those of similar institutions elsewhere, but it may be inferred that the cases of phthisis and albuminuria are comparatively few.

<sup>1</sup> See footnote on page 23.

NUMBER OF CASES OF THE DISEASES MENTIONED IN THE SCHEDULE, OBSERVED  
AT THE WEST CORNWALL DISPENSARY, PENZANCE, IN TEN YEARS, 1880—1889.

*From particulars furnished by Dr. Montgomerie.*

Total number of cases in the ten years . . . . .	14,597
Anæmia . . . . .	524
Debility . . . . .	322
Scrofula . . . . .	177
Tabes mesenterica . . . . .	13
Phthisis . . . . .	243
Hæmoptysis . . . . .	45
Acute bronchitis . . . . .	40
Chronic bronchitis . . . . .	316
Catarrh . . . . .	140
Pneumonia . . . . .	26
Chronic pneumonia . . . . .	38
Pleurisy . . . . .	24
Asthma . . . . .	41
Acute renal dropsy . . . . .	1
Albuminuria . . . . .	32
Calculus . . . . .	7
Gravel . . . . .	1
Acute rheumatism . . . . .	25
Rheumatoid arthritis . . . . .	226
Neuralgia . . . . .	161
Eczema . . . . .	297
Acne . . . . .	10
Psoriasis . . . . .	60
Alopecia areata . . . . .	24
Herpes zoster . . . . .	16
Pruritus . . . . .	27
Tinea tonsurans . . . . .	21
Pemphigus . . . . .	9
Purpura . . . . .	1
Pityriasis versicolor . . . . .	9
Erythema nodosum . . . . .	26
Ecthyma . . . . .	2
Icthyosis . . . . .	2
Lupus . . . . .	10
Urticaria . . . . .	12
Scabies . . . . .	9
Sycosis . . . . .	1
Syphilitic eruption . . . . .	20
Lichen . . . . .	16
Malarial affections . . . . .	2
Typhoid fever . . . . .	8
Diarrhœa . . . . .	114
Scarlet fever . . . . .	2
Diphtheria . . . . .	0
Endemic sore throat . . . . .	14



# PHTHISIS AT PENZANCE

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## AGE IN RELATION TO PHTHISIS.

Age on Admission.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.	1889.	Total.
60 years and over . . . .	0	0	0	0	0	1	170	1	0	0	3
50 years and over . . . .	2	1	0	2	2	0	2	3	2	2	16
40 years and over . . . .	3	4	7	5	5	5	7	8	2	1	47
30 years and over . . . .	1	2	4	8	3	7	7	7	7	6	52
20 years and over . . . .	16	13	9	11	10	10	12	10	8	7	106
15 years and over . . . .	5	9	9	7	4	4	3	6	2	6	55
Under 15 years . . . .	1	0	0	0	0	2	2	1	1	2	9
											288

## ANÆMIA—OCCUPATION IN RELATION TO, IN FEMALES.

	Domestics.	Servants.	Tailoresses.	Out-of-door.	Total.
1889 . . . . .	32	40	20	2	94

There have been two cases of Pernicious Anæmia in males, not mentioned in large list:—

1889. Painter, 55. Lost sight of.

1890. Shoemaker, 67; died April 5, 1890. Marked case.

## OCCUPATION IN RELATION TO PHTHISIS.

	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.	1889.	Total.
Miners . . . . .	1	1	5	7	7	7	6	2	2	0	38
Labourers . . . . .	3	4	3	3	1	3	2	5	1	3	28
Blacksmiths . . . . .	0	0	0	0	0	1	0	0	1	0	2
Masons . . . . .	1	0	0	0	0	0	0	0	0	0	1
Sailors . . . . .	0	0	0	0	0	0	1	0	0	1	2
Fishermen . . . . .	0	2	4	2	1	0	0	2	2	3	16
Soldiers . . . . .	1	0	0	0	0	0	0	0	0	0	1
Tanners . . . . .	1	0	0	0	0	0	0	0	0	0	1
Carpenters . . . . .	1	1	1	2	1	0	1	0	2	0	9
Shoemakers . . . . .	1	0	0	1	0	1	1	0	1	1	6
Porters . . . . .	1	0	0	0	0	0	0	0	0	1	2
Post Office Clerks . . . .	0	0	0	0	0	1	0	0	0	1	2
Gasworkers . . . . .	0	0	0	0	0	0	0	0	1	0	1
Engineers . . . . .	0	0	0	0	0	0	0	1	0	0	1
Bakers . . . . .	0	0	0	0	0	0	2	0	1	0	3
Coachmen . . . . .	0	1	0	0	0	0	0	0	0	0	1
Tailoresses . . . . .	3	3	3	2	2	1	2	3	1	0	20
Domestics . . . . .	14	17	13	16	12	15	18	22	10	13	150
Garden Women . . . . .	0	0	0	0	0	0	1	1	0	0	2
Total Males . . . . .	11	9	13	15	10	13	13	10	11	11	116
Total Females . . . . .	17	20	16	18	14	16	21	26	11	13	172
											288

Domestic includes married women and spinsters, who have no employment other than home work.



MONTHLY MEANS FOR TEN YEARS (1880 TO 1889), OR AS MUCH OF THAT PERIOD AS COULD BE OBTAINED.  
*Highest and Lowest = Absolute Highest and Lowest in Period.*

PENZANCE.—Observations for Eight Years. 67 to 94 feet above Low Water. W. HOSKEN RICHARDS, Esq.

MONTH.	TEMPERATURE OF AIR IN MONTH.					Mean Temperature of Air in Month.	Mean Humidity.	Mean Maximum in Sun.	Sunshine.	WIND.						Mean Ozone.	Mean Cloud.	RAIN.			
	Highest.	Lowest.	Monthly Range.	Mean of Highest.	Mean of Lowest.					Mean Daily Range.	N.	E.	W.	N. E.	S. E.			N. W.	S. W.	Days it fell.	Inches.
Jan.	29.93	53	21	21	48.8	40.1	4.6	42.4	...	2	7	3	4	6	6	5	7	...	...	...	3.83
Feb.	29.87	55	28	20.1	46.6	40.3	6.3	43.4	...	2	8	1	4	4	6	5	9	...	...	...	4.17
Mar.	29.91	58	26.5	23.3	47.6	40.3	7.3	43.9	...	6	6	5	5	6	8	5	6	...	...	...	2.81
April	29.79	61	33	21.8	52.1	42.2	9.8	47.1	...	5	5	4	3	8	8	5	5	...	...	...	2.58
May	29.92	68	38	25.6	57.5	47.8	9.6	52.6	...	5	7	4	3	7	6	7	6	...	...	...	1.80
June	29.95	77	45	24.2	62.7	52.7	9.9	57.7	...	6	6	1	4	2	5	8	6	...	...	...	2.27
July	29.92	76	45	23	66.4	55.7	10.7	60.9	...	4	7	3	7	1	2	7	10	...	...	...	3.23
Aug.	29.93	74	49	20	65.8	56.4	9.4	61.3	...	5	7	1	6	3	5	6	6	...	...	...	2.20
Sept.	29.87	72	39	22	61.6	53.0	8.6	57.3	...	5	6	2	4	4	4	5	5	...	...	...	4.11
Oct.	29.88	64	29	22	54.7	47.2	7.5	51.3	...	7	3	3	3	3	8	5	7	...	...	...	5.17
Nov.	29.82	59	33	19	50.5	44.9	5.6	47.7	...	3	5	1	6	7	2	7	8	...	...	...	5.05
Dec.	29.88	54	26	22	46.8	41.6	5.2	44.2	...	5	4	1	6	4	4	7	7	...	...	...	5.37
MAKER. Observations for Seven Years.																	The Rev. P. H. Newnham, Meteorological Society.				
Jan.	...	52.7	17.3	24.7	44.7	37.1	7.6	40.9	89	...	...	...	...	...	...	...	...	...	7.8	18	2.61
Feb.	...	55.2	27.5	22.7	47.4	39.2	8.2	43.3	89	...	...	...	...	...	...	...	...	...	7.7	18	2.94
Mar.	...	61.4	23.2	39.6	49.1	38.6	10.4	43.9	83	...	...	...	...	...	...	...	...	...	6.3	16	2.26
April	...	68.7	30.5	29.2	53.2	41.3	11.8	47.3	79	...	...	...	...	...	...	...	...	...	6.1	15	3.31
May	...	77	34	32.7	59.0	45.8	13.2	52.4	79	...	...	...	...	...	...	...	...	...	5.9	13	1.79
June	...	80.5	39.5	32.4	63.1	58.8	12.3	56.7	81	...	...	...	...	...	...	...	...	...	6.4	16	2.20
July	...	87.5	44.5	31.5	66.6	54.2	12.4	60.4	83	...	...	...	...	...	...	...	...	...	6.5	18	2.72
Aug.	...	83.0	42.0	30	67.7	54.5	13.1	61.1	83	...	...	...	...	...	...	...	...	...	6.1	14	2.01
Sept.	...	80.0	36.5	29.7	63.3	51.8	11.4	57.5	87	...	...	...	...	...	...	...	...	...	6.6	18	3.72
Oct.	...	67.0	30.5	28.8	55.8	45.2	10.6	50.5	85	...	...	...	...	...	...	...	...	...	6.6	20	3.89
Nov.	...	60.6	30.2	24.6	51.3	43.2	8.0	47.3	86	...	...	...	...	...	...	...	...	...	7.6	22	3.78
Dec.	...	55.0	24.0	24.9	47.4	39.8	7.6	43.6	88	...	...	...	...	...	...	...	...	...	7.4	21	3.44

MAKER. Observations for Seven Years. The Rev. P. H. Newham, Meteorological Society.

METEOROLOGY OF PENZANCE

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QUARTERLY AND YEARLY MEANS FOR TEN YEARS (1880 to 1889), OR AS MUCH OF THAT PERIOD AS COULD BE OBTAINED.

PENZANCE.

MONTH.	Mean Pressure of Atmosphere in Month.		TEMPERATURE OF AIR IN MONTH.						Mean Temperature of Air in Month.	Mean Humidity.	Mean Maximum in Sun.	Amount of Sunshine.	WIND.								RAIS.				
	Highest. Lowest in the 10 years.	Monthly Range.	Mean of Highest.	Mean of Lowest.	Mean Daily Range.	Strength.	N.	S.					E.	W.	N.E.	S.E.	N.W.	S.W.	Mean Ozone.	Mean Cloud.	Days it fell.	Inches			
Jan.—Mar.	29.90	58	21	21.4	46.3	40.2	6.0	43.2	...	...	...	...	...	3.3	7	3	4.3	5.3	6	5	7.3	...	...	...	10.61
Apr.—June.	29.88	77	33	23.8	57.4	47.5	9.7	52.4	...	...	...	...	...	5.3	6	3	3.3	5.6	6.3	6.6	5.6	...	...	...	6.65
July—Sept.	29.90	76	39	21.6	64.6	55.0	9.5	59.8	...	...	...	...	...	4.6	6	2	5.6	2.6	3.6	6	7	...	...	...	9.54
Oct.—Dec.	29.86	64	26	21.0	50.6	44.5	6.1	47.7	...	...	...	...	...	3	4	1.6	5	6	3	7	6	...	...	...	15.59
Whole Year.	29.88	77.0	21.0	21.7	54.7	46.8	7.8	50.7	...	...	...	...	...	4	5.7	3.4	4.5	4.8	4.7	6	6.4	...	...	...	42.59

MAKER.

Jan.—Mar.	61.4	17.3	29.0	47.0	38.3	8.7	87	...	...	...	...	...	...	...	...	...	...	...	7.2	52	7.81
Apr.—June.	80.5	30.5	31.4	58.4	45.9	12.7	79	...	...	...	...	...	...	...	...	...	...	...	6.1	44	7.33
July—Sept.	87.5	36.5	30.4	65.8	53.5	12.3	84	...	...	...	...	...	...	...	...	...	...	...	6.4	50	8.48
Oct.—Dec.	67.0	24.0	26.1	51.5	42.7	8.7	86	...	...	...	...	...	...	...	...	...	...	...	7.2	63	11.11
Whole Year.	87.5	17.3	29.2	55.6	45.1	10.6	84	...	...	...	...	...	...	...	...	...	...	...	6.7	209	34.73

FALMOUTH.

Jan.—Mar.	57.0	22.8	22.2	47.0	39.7	7.1	83	...	82	1.5	6	5	7	8	...	...	...	...	...	...	...
Apr.—June.	76.3	29.6	23.6	56.8	46.8	9.9	80	...	206	1.0	6	5	7	9	...	...	...	...	...	...	...
July—Sept.	79.8	36.8	22.3	63.9	50.0	9.7	82	...	188	0.9	6	3	7	11	...	...	...	...	...	...	...
Oct.—Dec.	63.5	25.0	22.0	51.7	44.2	7.4	83	...	78	1.3	6	4	6	10	...	...	...	...	...	...	...
Whole Year.	79.8	22.8	22.5	54.8	46.1	8.5	82	...	554	1.1	6	4	6	9	...	...	...	...	...	...	...



Anæmia, rheumatoid arthritis (including possibly some forms of rheumatism) and eczema present themselves abundantly. The influence of sea-air in causing anæmia and some forms of skin-disease is apparent on many parts of the sea-coast. Dr. Montgomerie considers that cases of phthisis do well at Penzance and tells me that hæmoptysis is rare among them. He has known chronic bronchitis and renal disease to derive benefit; he has no evidence with regard to asthma. Tubercular affections not of the lungs, coming under the heading of scrofula, are not especially infrequent at Penzance, whence it must be concluded that if the local influence of this place discourages, as it seems to do, the development of pulmonary phthisis, this is rather by discouraging inflammatory affections of the respiratory organs than by any antagonism to tubercle *per se*. It may fairly be inferred (though more evidence is to be desired) that acute and chronic forms of albuminuria are comparatively infrequent at Penzance as in Cornwall generally; no doubt the equability of the climate is beneficial in this respect; but it is probable that as a resort in albuminuria one with less humidity would be better.

#### FALMOUTH.

Most that has been said with regard to Penzance applies also to Falmouth. Within the Falmouth Registration District there is about the same low death-rate from diseases of the respiratory organs as pertains in that of Penzance, while it is to be noted that deaths from phthisis are in less proportion at Falmouth. This may possibly be attributed to the larger immigration of phthisis at Penzance. It is to be observed that at both places there is a certain amount of mining, especially at Penzance, which includes the large mining centre of St. Just. The frequency of phthisis among miners is well known, and must be allowed for in any attempt to estimate the frequency of this disease among other classes. If we could exclude the mining population and also phthisical immigrants, it is evident that the proportionate mortality from phthisis would at both these places be much less than appears. Nevertheless that at Falmouth is very low—1·92 per thousand as compared with 2·12, the rate for England. Scrofula, that is tuberculosis not of the lungs, is less frequent at Falmouth than at Penzance. Judging of the south coast of Cornwall from



MONTHLY MEANS FOR TEN YEARS (1880 TO 1889), OR AS MUCH OF THAT PERIOD AS COULD BE OBTAINED.  
*Highest and Lowest = Absolute Highest and Lowest in Period.*

FALMOUTH.—Observations for Ten Years. 90 feet above Mean Sea Level. CORNWALL POLYTECHNIC.

Month.	Mean Pressure of Atmosphere in Month.	TEMPERATURE OF AIR IN MONTH.					Mean Tem- perature of Air in Month.	Mean Humidity.	Mean Maximum in Sun.	Amount of Sunshine.	Strength.	Wind.			Mean Cloud.	Rain.	
		Highest.	Lowest.	Monthly Range.	Mean of Highest.	Mean of Lowest.						N.	S.	E.	W.	Days it fell.	Inches.
Jan.	30.06	54.9	29.8	21.9	46.4	39.6	42.7	85	...	46	1.4	6	6	8	...	20	3.42
Feb.	30.00	55.1	29.9	20.8	46.9	39.9	43.0	84	...	72	1.6	6	5	8	...	18	3.76
Mar.	29.96	57	25.4	23.9	47.8	39.7	43.1	81	...	128	1.5	6	6	7	...	17	3.55
April	29.88	62.8	29.6	22.0	51.0	42.0	46.2	81	...	174	1.3	7	7	6	...	15	2.66
May	30.00	70.4	38.4	24.5	56.9	46.9	51.7	80	...	207	1.0	6	6	8	...	14	2.16
June	30.02	74.3	43.0	24.5	62.5	51.7	57.2	79	...	237	0.8	7	3	7	...	14	2.19
July	29.97	79.8	46.9	23.2	65.4	54.7	59.9	80	...	214	0.9	6	2	8	...	18	3.58
Aug.	30.00	67.1	47.0	21.4	65.1	55.0	59.5	84	...	206	0.8	6	4	8	...	15	2.55
Sept.	29.99	71.7	36.8	22.3	61.2	52.5	56.3	84	...	144	0.9	7	4	7	...	18	3.80
Oct.	29.93	63.5	33.1	21.6	54.9	46.8	50.3	83	...	112	1.2	8	6	5	...	20	5.67
Nov.	29.92	59.0	32.0	21.4	51.7	44.9	47.8	84	...	67	1.5	5	5	8	...	22	5.93
Dec.	29.99	55.6	25.0	23.1	48.5	41.0	44.2	84	...	56	1.3	7	3	7	...	21	5.28

BODMIN.—Observations for Nine Years. 314 feet above Mean Sea Level. Commander Liddell, Cornwall Polytechnic.

Month.	Mean Pressure of Atmosphere in Month.	Highest.	Lowest.	Monthly Range.	Mean of Highest.	Mean of Lowest.	Mean Tem- perature of Air in Month.	Mean Humidity.	Mean Maximum in Sun.	Amount of Sunshine.	Strength.	N.	S.	E.	W.	Mean Cloud.	Days it fell.	Rain. Inches.
Jan.	30.02	56	12	27	...	...	40.0	...	...	...	...	...	...	...	...	...	19	3.92
Feb.	29.92	55	20	25	...	...	41.6	...	...	...	...	...	...	...	...	...	18	4.92
Mar.	29.90	61	20	26	...	...	42.6	...	...	...	...	...	...	...	...	...	16	3.74
April	29.87	68	27	29	...	...	48.0	...	...	...	...	...	...	...	...	...	14	3.09
May	29.99	75	32	34	...	...	55.0	...	...	...	...	...	...	...	...	...	15	2.50
June	30.01	78	40	29	...	...	60.5	...	...	...	...	...	...	...	...	...	14	2.78
July	29.97	81	43	26	...	...	61.8	...	...	...	...	...	...	...	...	...	19	4.50
Aug.	29.99	80	44	26	...	...	61.7	...	...	...	...	...	...	...	...	...	16	2.85
Sept.	29.95	78	36	29	...	...	57.1	...	...	...	...	...	...	...	...	...	21	5.96
Oct.	29.92	66	27	27	...	...	49.6	...	...	...	...	...	...	...	...	...	23	5.34
Nov.	29.82	63	27	24	...	...	45.9	...	...	...	...	...	...	...	...	...	23	5.34
Dec.	29.93	55	20	28	...	...	41.4	...	...	...	...	...	...	...	...	...	22	5.09

Penzance and Falmouth, including Fowey in the general estimate, and accepting Penzance as presenting on the whole the character of the climate in the highest degree, it is to be inferred that inflammatory affections of the lungs are in abeyance and mortality from phthisis controlled. Albuminuria would seem to be also in abeyance, notwithstanding the moisture of the climate; while any tendency to anæmia or skin disease is exaggerated.

#### FOWEY.

I have received a report from Mr. Percy Davies, of Fowey, in which he states that anæmia, scrofula, and diseases of the respiratory organs are not more prevalent there than on other parts of the south coast, and that the climate is generally suitable for them. Hæmoptysis and skin diseases according to Mr. Davies are not common; renal diseases are comparatively rare; rheumatism and neuralgia are rather prevalent; endemic diseases are rarely seen. There is no general cause of death among the old people, of whom there are many over eighty years of age. The drainage is very fair; into the sea. The water supply is generally good, though deficient in the houses of the higher level, a deficiency which is about to be remedied.

As regards the north coast the following details may be presented.

#### HAYLE.

Hayle is a small town on the eastern shore of the estuary which forms the most inland portion of St. Ives Bay. As the resort of shipping and the seat of large ironworks, Hayle is better known in connection with commerce than with health. It is within five miles of St. Ives, which is at the western corner of the bay, and about a mile and a half from Phillack, where the meteorological observations which have been recorded were taken. As bearing upon the climatic effect of the neighbouring coast, including St. Ives, I am glad to be able to adduce *verbatim* the valuable observations of Dr. Cleaver, of Hayle:—

#### *Hayle and its Neighbourhood.*

“I. (a) Anæmia and debility are not common. The climate is bracing and very suitable for their cure.



MONTHLY MEANS FOR TEN YEARS (1850 TO 1859), OR AS MUCH OF THAT PERIOD AS COULD BE OBTAINED.  
*Highest and Lowest = Absolute Highest and Lowest in Period.*

HAYLE.—Observations for Ten Years. About 70 feet above Mean Sea Level. G. HOCKIN, Esq., Phillock Rectory.

Month.	Mean Pressure of Atmosphere in Month.	TEMPERATURE OF AIR IN MONTH.				Mean Temp. of Air in Month.	Humidity.	Mean Maximum in Sun.	Amount of Sunshine.	Strength.	WIND.			Mean Cloud.	RAIS.	
		Highest.	Lowest.	Monthly Range.	Mean of Highest.	Mean of Lowest.					N.	E.	S.		Days it fell.	Inches.
Jan.	30.03	59	20	23	46	38	7	42	...	...	...	...	...	...	17	2.72
Feb.	29.97	57	25	23	48	40	8	44	...	...	...	...	...	...	16	2.72
Mar.	29.95	65	27	28	50	39	11	45	...	...	...	...	...	...	16	2.61
April	29.86	69	32	29	56	42	13	49	...	...	...	...	...	...	14	2.11
May	30.01	88	36	40	66	47	19	57	...	...	...	...	...	...	12	1.74
June	30.02	99	40	41	72	51	21	61	...	...	...	...	...	...	12	2.07
July	30.00	89	39	37	74	53	20	63	...	...	...	...	...	...	16	3.23
Aug.	30.03	83	37	29	68	52	15	60	...	...	...	...	...	...	12	2.26
Sept.	30.00	79	28	27	63	49	14	56	...	...	...	...	...	...	14	2.97
Oct.	29.93	67	24	25	56	44	11	50	...	...	...	...	...	...	19	4.58
Nov.	29.90	61	30	23	52	42	9	47	...	...	...	...	...	...	21	4.35
Dec.	29.95	58	24	25	48	39	9	44	...	...	...	...	...	...	21	4.04

BUDE. Observations for Nine Years. J. ARTHUR, Esq. Meteorological Society.

Month.	Mean Pressure of Atmosphere in Month.	Highest.	Lowest.	Monthly Range.	Mean of Highest.	Mean of Lowest.	Mean Temp. of Air in Month.	Humidity.	Mean Maximum in Sun.	Amount of Sunshine.	Strength.	N.	E.	S.	W.	Mean Cloud.	Days it fell.	Inches.
Jan.	...	55.3	16.1	30.7	45.9	35.8	10.0	40.8	...	...	...	...	...	...	...	7.5	14	3.02
Feb.	...	59.0	21.1	28.2	46.8	36.6	10.0	41.7	...	...	...	...	...	...	...	6.8	12	2.39
Mar.	...	64.5	18.1	33.9	48.2	36.2	11.9	42.2	...	...	...	...	...	...	...	6.0	9	2.27
April	...	73.0	26.1	33.7	53.2	39.3	13.8	46.3	...	...	...	...	...	...	...	5.8	9	1.68
May	...	79.4	30.1	37.3	52.7	33.6	13.8	51.7	...	...	...	...	...	...	...	5.9	10	1.81
June	...	85.0	33.7	36.6	64.1	49.9	14.2	51.3	...	...	...	...	...	...	...	5.8	8	1.87
July	...	86.2	33.2	33.6	65.5	53.4	12.2	59.4	...	...	...	...	...	...	...	6.4	11	2.45
Aug.	...	85.0	40.1	33.9	66.5	53.0	13.5	59.7	...	...	...	...	...	...	...	5.8	12	2.13
Sept.	...	81.0	31.1	37.2	63.3	50.0	13.3	56.6	...	...	...	...	...	...	...	6.1	11	3.12
Oct.	...	71.9	24.7	31.5	56.3	44.1	12.2	50.2	...	...	...	...	...	...	...	6.5	15	3.92
Nov.	...	64.0	24.6	28.7	51.6	42.0	9.5	46.8	...	...	...	...	...	...	...	7.3	17	3.88
Dec.	...	56.4	16.1	30.1	47.8	38.0	9.8	42.9	...	...	...	...	...	...	...	7.4	15	4.35



QUARTERLY AND YEARLY MEANS FOR TEN YEARS (1880 TO 1889), OR AS MUCH OF THAT PERIOD AS COULD BE OBTAINED.

HAYLE.

MONTH.	TEMPERATURE OF AIR IN MONTH.					Mean Humidity.	Mean Maximum in Sun.	Sunshine.	WIND.					RAIS.	
	Mean Pressure of Atmosphere in Month.	Highest, Lowest, in the 10 years.	Monthly Range.	Mean of Highest.	Mean of Lowest.	Mean Daily Range.			Strength.	N.	E.	W.	Mean Cloud.	Days it fell.	Inches.
Jan.—Mar.	29.98	65	20	48	39	8.6	43	...	...	...	...	...	...	49	8.05
Apr.—June	29.96	99	32	64	46	17	56	...	...	...	...	...	...	38	5.92
July—Sept.	30.00	79	28	63	49	14	56	...	...	...	...	...	...	14	2.97
Oct.—Dec.	29.92	67	24	52	41	9.6	47	...	...	...	...	...	...	61	12.97
Whole Year	29.96	99	27	56	43	12	50	...	...	...	...	...	...	162	29.91
BUDE.															
Jan.—Mar.	...	64.5	16.1	30.9	46.9	10.6	41.5	...	...	...	...	...	6.7	35	7.08
Apr.—June	...	85.0	26.1	35.8	56.6	40.9	49.7	...	...	...	...	...	6.1	25	6.15
July—Sept.	...	86.2	31.1	34.9	65.1	18.0	58.5	...	...	...	...	...	6.1	34	7.70
Oct.—Dec.	...	71.9	16.1	30.1	51.9	41.0	46.6	...	...	...	...	...	7.0	47	12.15
Whole Year	...	86.2	16.1	32.6	55.1	12.0	49.0	...	...	...	...	...	6.4	141	33.68
SCILLY.															
Jan.—Mar.	29.96	57	29	48.7	41.8	6.4	45.3	...	...	6	7	8	...	56	7.65
Apr.—June	29.94	73	36	55.9	47.9	8.0	52.0	...	...	8	7	6	...	42	5.54
July—Sept.	29.96	75	44	63.4	55.4	8.0	62.9	...	...	6	4	7	...	50	7.52
Oct.—Dec.	29.91	65	32	58.0	46.7	6.3	49.7	...	...	7	5	7	...	64	11.52
Whole Year	29.94	75	29	55.2	47.9	7.1	52.4	...	...	6	6	8	...	212	32.23

"(b) Scrofulous diseases. Not infrequently met with, though they are chiefly the result of hereditary taint, and perhaps of intermarriage, during successive generations, of near relatives. I believe the climate to be as good as any for their cure.

"(c) Diseases of respiratory organs:

"Phthisis. Not uncommon, and with more or less hæmoptysis in, say, nearly half the cases.

"Bronchitis and pneumonia are perhaps the most frequent diseases, owing to the very high winds commonly prevailing, which blow chiefly from cold quarters such as north and north-east.

"Pleurisy is met with in connection with pneumonia, and from the same cause, but not so frequently.

"Asthma is rather frequent, chiefly of the bronchitic form, and perhaps is a result of the very frequent attacks of bronchitis to which the children of the poor are subject. The climate of Hayle itself is not suitable for asthmatic cases, though parts of the surrounding country are not unfavourable.

"(d) Acute renal dropsy. Have not met with a case during a residence of four and a half years.

"Chronic albuminuria is rather frequent, and often presumed to be associated with granular kidney.

"Calculus and gravel. Not frequent. Have not seen a case of calculus during four and a half years' residence.

"(e) Rheumatism is, chiefly in the subacute form, rather frequent. Chronic rheumatoid arthritis much less so; in fact, rather rare.

"Neuralgiæ, especially sciatic and intercostal, are somewhat frequent. The climate is not very favourable for the cure of chronic rheumatism.

"(f) Skin diseases. Uncommon, with the exception of eczema, which is rather frequent.

"(g) There are no endemic diseases. Occasional cases of typhoid fever, in the person of sailors, are imported from foreign ports, but these are rare.

"Malarial affections. None.

"Diarrhœa. Very little.

"Scarlet fever and diphtheria. Rarely imported.

"Endemic sore throat. None.



"II. The majority of deaths are directly or indirectly caused by diseases of the respiratory apparatus. Subjoined is an analysis of eighty-seven consecutive death certificates:

Pneumonia . . . . .	15	
Bronchitis . . . . .	5	} 9
Do. following measles . . . . .	4	
Phthisis . . . . .	12	
Cancer . . . . .	4	
Hepatic dropsy . . . . .	2	
Bright's disease (chronic) . . . . .	3	
Heart affection . . . . .	1	
Do. following acute rheumatism . . . . .	1	
Old age (failure of heart) (ætat, 79 and 89) . . . . .	2	
Puerperal diseases . . . . .	2	
Apoplexy . . . . .	3	
Diarrhoea (all infants) (improper feeding) . . . . .	4	
Infants, the results of bad feeding . . . . .	10	
Typhoid fever . . . . .	1	
Erysipelas following injury . . . . .	1	
Diabetes . . . . .	1	
Scarlet fever . . . . .	1	
Various . . . . .	15	

"Of the above deaths, twelve occurred in persons between 70 and 80 years of age and three in persons over 80.

"The climate does not seem to be a bar to the attainment of old age.

"III. There is very little proper drainage. The open privy system is the rule.

"IV. About one half the town is sufficiently supplied with good water from a reservoir and spring at three fourths of a mile distance. The remaining and poorer half is supplied by private wells and pumps.

"The chief feature of the climate is the prevalence of high winds, which arise somewhat suddenly, and veer about with rapidity, necessitating constant arming on the part of invalids.

"In other respects the climate is most equable, the thermometer varying but a few degrees between the temperature of the day and that of the night, seldom going much below 32° F. in winter, and not often reaching it. Frost is rare, snow rarer, and the early



summer is invigorating. The highest temperatures of summer are almost always modified by breezes from the sea.

"The rainfall is pretty evenly distributed and not excessive. The soil being sandy, any excess is soon drained off.

"WILLIAM F. CLEAVER, M.D.

"HAYLE, 9th April, 1890."

#### PERRANPORTH.

I have received from Mr. Whitworth, of St. Agnes, a valuable report concerning St. Agnes and Perranporth. The testimony this affords as to the mildness of the winter climate is an addition to what has been adduced with regard to other parts of the north coast. As a health resort St. Agnes may be dismissed from consideration and Perranporth alone taken into view. This place is small but increasing, and it cannot fail to become better known and more visited, both in summer and winter, than at present. It is situated on a tract of sand which forms part of a large accumulation of this material which gives the leading characters to the district and has conferred the name of Perranzabuloe (*Sanctus Piranus in sabulo*) upon the parish in which it is situated. The sandy expanse provides a long beach on which the Atlantic rollers break with a magnificence which is not surpassed in the county; there are imposing cliffs which limit the sandy tract and superadd scenery of a different kind and of great grandeur. Placed far to the south, and fully exposed to the Gulf Stream, this place like Newquay may be suggested as a winter resort for persons for whom the south coast is too relaxing; it is much warmer, and less unsuited as a winter residence for delicate persons, than Tintagel or Bude.

#### "ON THE CLIMATOLOGY OF THE ST. AGNES DISTRICT."

I. "THE St. Agnes district comprises the two parishes of St. Agnes and Perranzabuloe, but vaguely speaking many of the remarks will apply to north-west Cornwall in general.

"The St. Agnes district stretches along the north coast for about twelve miles. It adjoins the Newquay district on the east, and the Hayle and St. Ives districts on the west. Inland it abuts on Truro and Redruth. The county here is eighteen miles across to Falmouth, which is directly south. A range of granitic hills runs down through the middle of the county almost parallel to the north and south coast lines, which is often called "The Backbone of Cornwall." South of the St. Agnes district and distant seven miles from the coast these hills are 700 feet in height. From this range and at right

angles to its valleys run to the sea, on nearing which they become narrow and gorge-like. These valleys are sheltered, very warm, and fertile. Orchards abound, cherries and plums grow wild on the hedges, rare ferns and flowers are prolific, and vegetation in general luxuriant. On the higher land trees are sparse, consequent no doubt on its being more exposed to the Atlantic, although some affirm with good reason that the paucity of trees is due to the timber being appropriated in ages past for mining operations. What few trees there are grow naturally with an inclination to the east and north-east, affording ocular demonstration of the prevalence of west and south-west winds, which tend, with the Gulf Stream, to make our climate so equable. The higher ground, however, is good arable and pasture land, and is well farmed.

"Cornwall is necessarily a humid county, but from the configuration described all water is quickly shed into the valleys, or absorbed into the substratum of clay slate, so that the ground is rarely wet or muddy for any length of time. This immediate part of Cornwall is, I believe, about the driest part of the county, and I think the statistics of rainfall which I am collecting will confirm me.

"The hills before mentioned influence the climate to an appreciable extent, especially in summer. South of the hills (the Falmouth side) it is warmer, more humid, and more relaxing. This the north side is cooler, drier, and more bracing.

"The two chief places in this district are St. Agnes and Perranporth, both on the coast. St. Agnes is a small mining town with a little harbour for local imports. There is a small beach, but the sand is sullied by the refuse washed down from the mines. A few visitors resort hither in the summer, but it has not the inherent attractions and accommodation for a watering-place, besides which, being badly drained, typhoid fever occurs almost annually.<sup>1</sup> Four miles east of St. Agnes, where three or four narrow valleys converge at the seashore, is Perranporth, a place attaining a greater reputation every year as a summer and winter resort. It possesses a magnificent beach of beautifully clean white sand, backed by lofty cliffs, at the foot of which are excellent bathing nooks. The houses are well built and specially adapted for the accommodation of visitors. The neighbouring valleys afford sheltered and picturesque walks. The climate is very equable, cool in summer, warm in winter. This last winter, 1889-90, we have had no snow (not an unusual occurrence) and very little frost. Being influenced by the general fashion of the profession, I advised a patient with decided phthisis to pass the winter of 1888-89 in the South of Europe. He went to Italy. The whole of the following winter (1889-90) he spent at Perranporth.

"He prefers the climate of Perranporth to that of Genoa, chiefly on the ground of the greater equability of the former, and considers that Perran has a strong claim to consideration as a winter resort. The temperature of his bedroom here, without a fire, during the winter never went below 48°.

"I may add that the climate is much milder on the coast than it is only a few miles inland.

"With regard to the prevalence of disease in this district, and taking those named on the circular, I would say that :—

"(a) *Anæmia* is rare.

<sup>1</sup> At the present moment (19/10/94) a proper system of drainage is being laid down on plans prepared by Mr. R. H. Worth, C.E., of Plymouth, and a good water supply is to follow immediately. Hence the words "badly drained" will not now apply. St. Agnes town is 300 feet above sea-level, on the slope of a hill which rises to a height of 620 feet, and is open to the Atlantic breezes. It should in future and no doubt will have a much better health record.



"(b) Scrofula, understanding the word to apply to chronic glandular enlargements and all external manifestations of the scrofulous diathesis, is exceedingly rare.

"Tuberculous diseases other than phthisis are also infrequent.

"(c) Phthisis, bronchitis, pneumonia, and pleurisy are about as common as in other parts of England, except among the miners, in whom phthisis and bronchitis are probably more prevalent.

"True asthma is rare.

"(d) Acute renal dropsy, chronic albuminuria, calculus, and gravel are very rare.

"(e) Rheumatism, Rheumatoid arthritis, neuralgic are about as common as elsewhere.

"(f) Diseases of the skin are not common.

"(g) There are no true malarial diseases in this district.

"Typhoid is common at St. Agnes, where, according to the medical officer of health's report, 'the soil must be more or less permeated with typhoid germs.' On the other hand, it is almost unknown at Perranporth, and in the country parts of the district generally.

"Diarrhoea, scarlet fever, diphtheria, and sore throat occur in occasional epidemics as elsewhere. Diphtheria, however, is much less frequently epidemic than the others named.

"As regards the influence of climate on :—

"(a) Anæmia. It may be stated that the infrequency of anæmia in the local inhabitants is no doubt due to their proximity to the Atlantic. This ensures the purest air and freest oxygenation of the blood. In addition, the neighbourhood is so mineralised that there are but few springs which do not show the presence of iron in the water. The district is therefore eminently suitable for anæmic and debilitated patients.

"(b) Scrofulous and tuberculous cases would also be much benefited by residence on this coast, especially at Perranporth, where the incessant pounding of the Atlantic billows on the strand causes such a dispersion of marine spray that iodine and other constituents of sea-water are freely diffused through the atmosphere and become inhaled, constituting, so to speak, a huge natural medicated atomiser.

"(c) Cases of incipient phthisis and chronic phthisis from the colder parts of England or Scotland would find this part of Cornwall suitable for winter residence. The well-known equability of our climate more than compensates I think for the greater humidity. The climate also seems favourable to patients who suffer from paroxysmal attack of dyspnoea. Persons suffering from bronchitis and bronchitic asthma who cannot live but with difficulty at Falmouth and Penzance come over here and breathe much more freely.

"(d) The Cornish people, generally speaking, are temperate and frugal, hence cases of renal dropsy and chronic albuminuria are rare. The variations of temperature in this part of Cornwall are so slight that the dangers of sudden chills to patients suffering from chronic albuminuria are much diminished. The infrequency of calculus and gravel in this locality may be accounted for geologically. There being no lime-stone, the strata being clay slate overlying granite, consequently all drinking water is free from lime salts.

"(e) Rheumatic cases are no doubt proportional to the humidity. Acute rheumatism is much more common some winters than others. Our climate except in summer is unsuitable for these cases.

"(f) The climate is favourable rather than otherwise for cases of chronic skin diseases.

"(g) And also for convalescents from fevers.

"II. The following table, compiled from the returns for the three years, 1887, 1888, 1889, will show the common causes of death in the district :—



Phthisis . . . . .	13.22 per cent.
Bronchitis . . . . .	12.97
Apoplexy . . . . .	7.67
Cancer . . . . .	7.25
Heart disease . . . . .	5.77
Senectus . . . . .	5.66
Meningitis . . . . .	3.91
Enteric fever . . . . .	1.89
Infants under 1 year, mainly from Inanition, Convulsions, Broncho- Pneumonia, etc. . . . .	20.63
Various other causes . . . . .	20.98

"This table requires a few detailed remarks. It is seen that phthisis and bronchitis are far and away the chief causes of death here as elsewhere. Many of the bronchitic cases were octogenarians, and had it not been for some slight signs of chronic bronchitis would have been fairly classed under senectus.

"The percentage of apoplexy is inclusive of hemiplegia and other sequelæ. So the heart disease return is inclusive of all kinds of cardiac mischief and complications.

"The infantile mortality is large. It includes all cases of live birth, even when life lasted only an hour or so. But there are causes which tend to lessen the value of infant life in this district, and amongst these I would mention:—

"(1) The ease with which the decease of illegitimate and legitimate children can be registered without a medical certificate.

"(2) The infrequency of inquests. It is exceptional for an inquest to be held on a dead infant.

"(3) Infantile assurance.

"(4) Improper dieting. The lower classes are very ignorant in this respect.

"In the three years named there were no deaths from scarlet fever. There was one from diphtheria, and one or two from whooping-cough.

"Frequency of old age. In the year ending September 30th, 1888, of 105 persons who died 31 lived to an average of 79 years.

"The usual annual death-rate of this sub-registration district (St. Agnes) is 15 per 1000.

"III. The district being rural there is no special system of drainage adopted. The Truro Rural Sanitary Authority endeavours by means of their officers to keep the inhabitants up to the necessity of

"(1) Cleanliness in their houses.

"(2) Separate disposal of slop-water and house refuse (dry midden).

"(3) Proper situation for their closets, which are, with few exceptions, of the common privy style.

"IV. The water-supply is mainly from pumps and dip-wells, and, generally speaking, is excellent in quality and above suspicion."

TABLE I.<sup>1</sup>

AVERAGE RAINFALL AT ST. AGNES, CORNWALL, EACH MONTH FOR TWENTY YEARS FROM 1867 TO 1886 INCLUSIVE.

Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Yearly.
4.27	3.68	2.57	2.52	2.10	2.11	2.96	2.86	3.84	5.09	4.25	4.63	40.88

<sup>1</sup> I am indebted to Mr. J. Opie, of St. Agnes, and Mr. Crowther, of the Royal Institution of Cornwall, for these statistics.

TABLE II.

AVERAGE NUMBER OF DAYS WITH RAIN EACH MONTH FOR SAME PERIOD,  
1867-86.

Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Yearly.
16·17	16·4	12·16	10·16	10·00	10·8	11·11	12·3	14·7	18·5	16·6	18·15	167·05

COMPARISON OF RAINFALL AT ST. AGNES AND OTHER PLACES IN THE  
COUNTY.

PLACE.	1886.		1887.		1888.	
	Inches.	Wet days.	Inches.	Wet days.	Inches.	Wet days.
Bodmin ...	48·93	228	34·17	164	50·93	235
Truro ...	44·31	197	27·48	128	40·92	179
Falmouth ...	50·86	238	27·68	166	40·74	214
St. Agnes ...	41·63	161	25·60	132	40·73	182
Scilly ...	34·83	242	...	...	29·41	232

"WILLIAM WHITWORTH.

"ST. AGNES."

## NEWQUAY.

Mr. Nicholls reports very favourably of the climatic effects of this place, especially as regards diseases of the respiratory organs and kidneys, which estimate is borne out by what has already been adduced with regard to the registration district of St. Columb, to which Newquay belongs. Eczema he states to be "rather prevalent." According to the same observer, the neuralgiæ present themselves rather than rheumatism or the rheumatoid affections. From personal knowledge of the place, confined, however, to the autumn months, I should judge it to be bracing in comparison with the south coast, though decidedly warmer than Tintagel or Bude. It is probable that for many classes of invalids Newquay is to be preferred as an all-the-year-round residence to the south coast of the county. The air is presumably less humid and the warmer months less relaxing, while the cold of winter is considerably modified.

## PADSTOW.

Padstow comes into the registration district of St. Columb, which gives a low death-rate, as the table indicates, from diseases



of the respiratory organs taken together, from phthisis, from scrofula, and also from diseases of the urinary organs. Mr. Marley, who has been long in practice there, whose description of the place has been elsewhere referred to, has kindly furnished particulars of a more strictly medical character. He is of opinion that the "climate of Padstow and its immediate vicinity is most beneficial to those suffering from asthma, bronchial and other affections of the respiratory organs, and all strumous diseases." He says that not many residents suffer from scrofula, and considers the climate particularly adapted to those affected with it. When phthisis occurs among the natives he believes it to be often hereditary, or due to inter-marriage. Asthma rarely presents itself among the residents; cases coming from elsewhere "invariably obtain great benefit." This fact is worth noting in connection with similar evidence from the neighbouring district of Tintagel. Anæmia rarely comes on at Padstow, while visitors with it improve. Both acute renal dropsy and chronic albuminuria are, on the same authority, very rare; calculus and gravel almost unknown. The local influences of Padstow are, in Mr. Marley's opinion, not beneficial in rheumatoid affections or in skin disease, with especial reference to eczema. Zymotic diseases are infrequent. Infant mortality is considerable owing to improper feeding, but the survivors live to be very old. One third of the deaths are stated to occur after the age of seventy.

#### TINTAGEL AND BOSCASTLE.

The portion of North Cornwall included in these parishes is admirably suited climatically as a resort in summer and autumn for all who need a moderately bracing and pure air free from extremes of heat; and probably many persons who are bound to one place of abode might wisely select this stormy region as their permanent residence. The high level of Tintagel makes it especially bracing at all times, rather too much so in winter, though it must be added that near the coast there is little frost and no extreme cold. Many of the houses in the district near the sea are 300 feet above its level, while a mile and a half inland are many which present an elevation of 500 or 600 feet. The south-west storms are severely felt; the east wind is modified by circum-



stances which have been adverted to. The registration district of Camelford, which includes Tintagel and Boscastle, shows an extraordinary small proportion both of phthisis and of other diseases of the respiratory organs; and so far as high level and pure air are desiderata, Tintagel presents great claims to consideration. Owing to its southern latitude and the proximity of the ocean and the Gulf Stream, a higher level can be enjoyed without extreme cold than in most other parts of Great Britain.

The low mortality from phthisis and other diseases of the respiratory organs in this part of Cornwall is indeed one of the most striking results of this inquiry. Phthisis in the district of which Camelford is the centre, including Tintagel and Boscastle, presents a mortality of only 1·64 per thousand; diseases of the respiratory organs are only 1·80 per thousand. Further observations are needed before absolute reliance can be placed in the conclusion which presents itself. Probably some part of the immunity from phthisis must be attributed to the thinness of the population in this district; but nevertheless the figures are suggestive and would seem to accord with much that is now held with regard to the beneficial effects of high levels in this disease. It must be mentioned as a disadvantage that, particularly when the wind is in the south-west, wet mists are not infrequent, and occasionally last for several days together. These are the more prevalent, as will readily be believed, the higher the level; it is not uncommon for houses in the elevated country to be enveloped by these, while those near the sea level are exempt. Such mists, however, are much less frequent in North Cornwall than at the Lizard.

A gentleman, long a sufferer from asthma, who had visited on account of it the Cape of Good Hope and many parts of the Continent, found no place to suit him so well as Tintagel, in a house 500 feet above the sea, where he lived summer and winter. The amount of phthisis in this district and that of Boscastle is undoubtedly small, whether as compared with the southern and central parts of the country or with other parts of England. Mr. Wade, of Boscastle, has given his experience of this place, together with Tintagel, in these words:

"Scrofula and tuberculous diseases are not very common. Phthisis is not common; a few cases are met with accompanied

by hæmoptysis. Bronchitis and catarrh are more common than any other disease of the respiratory organs. Asthma is rare. Acute renal dropsy and chronic albuminuria are very rare. Calculus and gravel are not met with at all. Rheumatism, rheumatoid arthritis, and neuralgia are common. Skin diseases are rare, but eczema is more frequently met with than any other. The common causes of death are senile degeneration and heart disease. More than half the deaths during the year 1890 were of persons of sixty years of age and upwards. There were no deaths from any endemic disease or phthisis."

The general effect of the air in this district, more especially in the higher and open parts of it, is one of stimulation. Persons are more inclined to walk, and can walk further without fatigue, than in most other places. Some people find on first coming, and even afterwards, that they sleep for a shorter time and less soundly than is their wont. This is not the case with every one, but, nevertheless, I think that sufferers from insomnia would do better elsewhere than here. To the average person the high and exposed regions of the north coast are restorative and invigorating, and present advantages as health resorts of which the public as yet are but very imperfectly aware.

#### STRATTON AND BUDE.

I learn from Mr. Braund, the Medical Officer of Health for Stratton, that this district, which includes Bude, does not present many cases of phthisis, but that "the air is rather strong" for phthisical patients. There are very few cases of renal disease. He considers the air to be "rather predisposing to rheumatism, rheumatoid arthritis, and the neuralgiæ," upon which he does not report separately. He reports with regard to eczema "some few cases, but not general." He finds the air to be good for anæmia and debility.

Bude may probably be regarded as a bracing and beneficial resort in summer and autumn, well suited for cases of anæmia or debility, whether due to overwork or long residence in cities. All the effects of ample sea exposure, high level, and dry soil must be there experienced. It is too cold and exposed to be selected as a winter resort.



Leaving the coast, I will add a reference to the high-level inland country, taking as an example the moorland about the mountains.

Mrs. Alexander Marshall, who lives during the summer months at Parkwalls, on the edge of the moor which surrounds Rough Tor, at a distance of about two miles east of Camelford, and 900 feet above the sea, thus describes the characters of the district :

"The summers are generally cool, there is rarely very hot weather, though in 1887 and 1893 the heat was thought to be as great as in other places, though there was no means of comparing accurately. The seasons are generally three weeks behind the towns and the coast in vegetable produce. The winters are long, generally lasting into April. At this season the air is cold and keen, and the frosts are hard, though there are streams which are never frozen. There is a good deal of snow, though less than in the Eastern Counties. The air of the moor is too cold for residence in winter, to those accustomed to towns or lower levels, but is thought to be very healthy to those used to it. The prevalent winds are from the west and south-west ; the hard gales are much felt, and even early in autumn make the leaves of the trees look as if burnt ; this is attributed to the salt which these winds are thought to bring from the sea. The effect of the fine air upon the summer visitors, especially near Rough Tor, is very noticeable ; they at once remark its delicious freshness, and how well they walk, sleep, and eat. The inhabitants attain to great ages : four have recently died between ninety and one hundred ; many are now living between seventy and ninety ; people here are not considered old until past eighty, up to which age they continue hard agricultural work. Horses and sheep also attain great ages, horses frequently doing hard work over the age of thirty. The causes of the healthiness of the district are said to be—its great elevation, its proximity to the moor and the ocean, the abundant supply of the purest spring water, and the excellent natural drainage. Much rain falls, but the land dries quickly. The soil is a light, black peaty loam, from eight inches to a foot deep, on a subsoil of slaty rubbish, with a substratum of granite. Gravel occurs here and there.

"The pastures are exceptionally rich and healthy, and produce beef and mutton of the finest quality. Oats, root crops, and garden vegetables do well ; not so wheat and barley. Strawberries, raspberries, and currants ripen well at an altitude of nearly 700



feet; plums, apples, and pears flourish only in lower and more sheltered positions. Among forest trees the larch, cypress, and all kinds of firs do well, as also do oaks, beeches, ashes, elms, thorns, maples, and sycamores; all of which grow to a large size in the woods and hedges. Ferns present themselves in almost unexampled variety; wild flowers are abundant, and are noted for their full colours. Bees thrive and produce much honey."<sup>1</sup>

#### TRURO, BODMIN, AND LAUNCESTON.

The inland towns of Cornwall present little importance as health resorts, and may be briefly discussed. I have received information from Truro, Bodmin, and Launceston. The information from Truro, which appears to have been compiled with an unfavourable personal bias, is to the effect that anæmia, debility, phthisis, and diseases of the respiratory organs prevail, while renal diseases are not uncommon. The results of registration, as recorded at page 31, show that the mortality from phthisis is here undoubtedly large; that from diseases of the respiratory organs in general comparatively less, though larger than in some other parts of the county, notably those on the north coast. The mortality from phthisis at Truro is nearly the same as at Penzance, though at Penzance there is a considerable importation of phthisis, which is probably not the case at Truro. There is probably enough mining about Truro, as about many other Cornish towns, to increase the amount of phthisis to some extent; though Truro is not like Redruth—a great mining centre.

From Bodmin I have had a full and valuable report from Mr. R. B. Anderson. Mr. Anderson tells us, in accordance with what has already been shown, that the place is damp, especially in winter; that the winters are mild, but the spring changeable and trying. Mr. Anderson finds anæmia and debility to be common, scrofula and tuberculosis uncommon, phthisis with hæmoptysis rare. Inflammatory affections of the respiratory organs, bronchitis and catarrh, pneumonia and pleurisy, are all common in his experience; asthma rare. Both acute renal dropsy and chronic albuminuria he notes as rare; calculus has not occurred within his observation. According to the results of registration phthisis appears

<sup>1</sup> I have quoted with slight abridgment.

MONTHLY MEANS FOR TEN YEARS (1880 TO 1889), OR AS MUCH OF THAT PERIOD AS COULD BE OBTAINED.  
*Highest and Lowest = Absolute Highest and Lowest in Period.*

TRURO.—Observations for Ten Years. 43 feet above Mean Sea Level. N. WHITLEY, Esq.

Month.	Mean Pressure of Atmosphere in Month.	TEMPERATURE OF AIR IN MONTH.						Mean Temp. of Air in Month.	Humidity.	Mean Maximum in Sun.	Amount of Sunshine.	WIND.					Mean Ozone.	Mean Cloud.	RAIS.	
		Highest.	Lowest.	Monthly Range.	Mean of Highest.	Mean of Lowest.	Mean Daily Range.					Strength.	N.	E.	S.	W.			Days it fell.	Inches.
Jan.	29-98	56	12	32-0	47-6	37-1	10-4	42-2	84	...	...	2-2	6	8	8	...	7-7	14	3-04	...
Feb.	29-91	59	19	29-9	49-7	37-5	12-2	42-9	87	...	...	2-4	5	6	6	...	7-2	16	3-57	...
Mar.	29-89	62	19	34-3	51-3	37-2	14-1	42-9	84	...	...	2-4	7	7	6	...	6-3	15	3-10	...
April	29-79	69	25	35-5	55-6	39-4	16-2	45-6	81	...	...	2-5	7	8	7	...	6-0	12	2-38	...
May	29-89	78	28	38-6	61-8	44-8	16-8	51-3	76	...	...	2-3	6	7	7	...	6-2	11	1-92	...
June	29-90	86	36	37-0	67-1	50-1	17-0	56-0	78	...	...	2-2	8	4	7	...	5-6	11	2-20	...
July	29-85	89	37	36-7	69-4	53-1	16-2	59-0	79	...	...	2-2	6-9	3-2	7	...	6-1	15	3-14	...
Aug.	29-86	82	40	36-4	69-9	52-6	17-3	59-3	77	...	...	2-1	7	5	8	...	6-0	11	2-14	...
Sept.	29-86	80	30	37-1	65-7	50-0	15-7	56-4	84	...	...	2-1	6	5	8	...	6-0	14	3-30	...
Oct.	29-83	69	25	36-4	57-9	44-2	13-6	50-1	81	...	...	2-3	8	6	5	...	6-7	18	5-13	...
Nov.	29-83	63	26	29-6	53-3	42-3	11-0	47-6	82	...	...	2-2	5	5	7	...	6-8	21	4-94	...
Dec.	29-90	59	14	33-6	50-1	38-2	11-8	44-5	82	...	...	2-1	7	5	7	...	7-0	20	4-20	...

HELSTON.—Observations for Six Years. 106 feet above Mean Sea Level. Mr. JOHN GILL, Cornwall Polytechnic.

Jan.	30-20	58-0	21-9	26-8	48-7	40-1	8-6	44-2	87	...	...	...	...	...	...	...	...	7	7	6	6	8	...	7-3	16	2-99
Feb.	29-95	57-0	24-7	24-3	49-5	38-4	11	43-8	85	...	...	...	...	...	...	...	...	7	6	7	6	7	...	6-8	16	3-32
Mar.	29-70	61-6	24-7	29-1	50-2	38-7	11-4	44-3	84	...	...	...	...	...	...	...	...	7	9	6	7	...	6-1	17	3-03	
April	29-89	61-2	30-1	25-1	53-2	41-0	11-3	47-1	83	...	...	...	...	...	...	...	...	7	8	6	6	...	6-1	11	3-41	
May	30-06	73-6	34-5	31-9	58-4	46-0	12-2	52-1	82	...	...	...	...	...	...	...	...	7	7	8	7	...	5-7	13	1-49	
June	30-24	78-0	39-5	30-4	62-9	50-4	12-5	56-7	83	...	...	...	...	...	...	...	...	9	4	6	8	...	6-6	16	2-42	
July	29-93	78-3	40-5	28-3	64-9	53-1	11-8	58-1	85	...	...	...	...	...	...	...	...	8	1	10	12	...	6-8	19	3-39	
Aug.	30-01	80-7	42-4	24-4	65-4	53-8	11-4	59-7	85	...	...	...	...	...	...	...	...	9	4	5	10	...	6-5	15	2-10	
Sept.	30-00	74-7	39-0	26-1	62-8	51-7	11-1	57-2	88	...	...	...	...	...	...	...	...	9	7	7	7	...	6-4	14	3-10	
Oct.	29-96	68-0	32-4	26-0	57-4	46-5	10-5	52-0	85	...	...	...	...	...	...	...	...	9	7	5	7	...	6-7	18	4-11	
Nov.	29-98	64-3	31-6	24-9	53-9	45-1	8-7	49-5	87	...	...	...	...	...	...	...	...	7	4	6	9	...	7-0	23	4-42	
Dec.	29-75	62-6	25-7	28-3	51-1	41-1	9-9	46-1	87	...	...	...	...	...	...	...	...	8	3	6	12	...	6-8	20	4-36	



QUARTERLY AND YEARLY MEANS FOR TEN YEARS (1880 TO 1889), OR AS MUCH OF THAT PERIOD AS COULD BE OBTAINED.

## BODMIN.

Month.	TEMPERATURE OF AIR IN MONTH.						Mean Temperature of Air in Month.	Mean Humidity.	Mean Maxima in Sun.	Amount of Sunshine.	WIND.					Mean Cloud.	RAIN.	
	Highest. Lowest. in the 10 years.		Monthly Range.	Mean of Highest.	Mean of Lowest.	Mean Daily Range.					Strength.	N.	S.	E.	W.		Days it fell.	Inches.
Jan.—Mar.	29.94	61	12	26	...	...	41.4	...	...	...	...	...	...	...	54	12.58		
Apr.—June.	29.99	78	27	30	...	...	54.5	...	...	...	...	...	...	...	43	8.37		
July—Sept.	29.97	81	36	27	...	...	60.2	...	...	...	...	...	...	...	51	11.77		
Oct.—Dec.	29.89	66	20	26	...	...	45.6	...	...	...	...	...	...	...	66	16.39		
Whole Year.	29.94	81	12	27	...	...	50.4	...	...	...	...	...	...	...	214	49.11		
TRURO.																		
Jan.—Mar.	29.92	62	12	32.0	49.5	37.2	12.2	42.6	85	...	2.3	6	7	6	8	45	9.71	
Apr.—June.	29.86	86	25	37.0	61.5	44.7	16.6	50.9	78	...	2.3	7	6	7	10	34	6.50	
July—Sept.	29.85	89	30	36.7	68.3	51.9	16.4	58.4	80	...	2.1	6	4	7	7	40	8.58	
Oct.—Dec.	29.85	69	14	33.2	53.7	41.1	12.1	47.4	81	...	2.2	6	5	6	9	59	14.27	
Whole Year.	29.87	89	12	34.7	58.2	43.9	14.4	49.8	81	...	2.2	6	5	6	8	178	39.06	
HELSTON.																		
Jan.—Mar.	29.95	61.6	21.9	26.7	49.4	39.0	10.3	44.1	85	...	...	7	7	6	7	49	9.34	
Apr.—June.	30.06	78.0	30.1	29.1	58.1	45.8	12.0	51.9	82	...	...	7	6	6	7	40	7.32	
July—Sept.	29.98	80.7	39.0	26.2	64.3	52.5	11.4	58.3	88	...	...	8	4	7	9	48	8.59	
Oct.—Dec.	29.89	68.0	25.7	26.4	54.1	44.2	9.7	49.2	86	...	...	8	4	5	9	61	12.89	
Whole Year.	29.97	80.7	21.9	27.1	56.4	45.3	10.8	50.3	85	...	...	7	5	6	8	198	38.14	



to produce about the same mortality as at Truro, at which the death-rate from this cause, is, as has been stated, high. The drainage of Bodmin is defective, typhoid and epidemic sore-throat and scarlet fever occasional.

With regard to Launceston, I have received replies from Dr. Andrew and Mr. Shepherd. Dr. Andrew finds the climate frequently beneficial in anæmia and debility, and in the summer in phthisis. Reference to the results of registration (page 31) will show that the mortality from phthisis is exceedingly low in the Launceston division, as in other parts of North Cornwall; mortality from diseases of the respiratory organs on the other hand is high as compared with the county generally. Bronchitis is common on the evidence of both the gentlemen referred to, as also is rheumatism. Dr. Andrew reports asthma as very uncommon among the permanent residents, while imported cases of this disease derive marked benefit. Stone, on both authorities, is extremely rare, and both acute renal dropsy and chronic albuminuria infrequent. According to both, old age is frequently attained at Launceston, while the most frequent causes of death are this and diseases of the respiratory organs, among which Dr. Andrew specifies bronchitis. Dr. Andrew remarks on the exposure of the town to the north and east and the coldness of the winds from the moor, notwithstanding which he finds it to be generally healthy and the death-rate low.

From Camelford I have not succeeded in obtaining any report directly, but by the courtesy of Mr. Silvanus Trevail, the Chairman of the Sanitary Committee of the County Council, I have received some reports addressed to that Committee which have supplied me with certain particulars.

This little town—it contains only about 1,400 inhabitants—can scarcely be regarded as a health resort, or as presenting much interest excepting as a small commercial centre. It should be healthy, lying as it does at an elevation of 700 feet, and is advantageously situated within two miles of the moor, four of Rough Tor, and six of the sea. The town is occasionally visited by epidemics of typhoid, diphtheria, and scarlet fever. These three disorders presented themselves, as I am informed, after the long drought of 1893, and I am told that something of the same sort happened twelve and twenty-five years ago.

A recent outbreak of typhoid has drawn the attention of the County Council to the sanitary defects of this town.<sup>1</sup> The drinking water is chiefly obtained from wells which are liable to pollution; the drainage is defective, and the little river Camel which runs through it, to become in due course a broad salmon river, is at Camelford but a small stream in dry weather, and is contaminated by the contents of sewers and closets which discharge directly into it. Great improvements can scarcely fail to be soon accomplished; an excellent supply of pure water could be obtained from the moor within practicable reach, and it is possible that this town may soon acquire a good sanitary condition as an addition to the attractions which it derives from its situation.

### PART III

#### THE SCILLY ISLANDS.

FOR the purposes of this inquiry the extent and character of the Scilly Islands may be dealt with briefly, since, however great their interest to the traveller, they have as yet been little resorted to by invalids. Their climate is relaxing, and they are fully open to the east winds as well as to the west, from which their low level affords very insufficient protection; nevertheless, as will be seen, they deserve consideration, possibly more than they have yet received. The archipelago consists of a closely packed group of islands and rocks in the Atlantic in the direct course of the Gulf Stream. The largest of them is thirty-six miles from Penzance, thirty miles from the Land's End. Of the forty islands which bear herbage only five are inhabited, and only one—St. Mary's—is possessed of any accommodation which would be satisfactory to the invalid or fastidious traveller. This island, the largest of the group, contains only 1,600 acres; no part of it is a mile from the sea, which is a fully exposed portion of the Atlantic Ocean. It is said that the lighthouse named the Bishop, which marks this group, is the most exposed in the world. The cliffs are of less altitude than those of the Land's End, but possess a peculiar grandeur, which they owe to the ruggedness of the great masses of granite of which they are

<sup>1</sup> Report of Dr. Permewan on the sanitary condition of Camelford.



composed, and the fantastic shapes which have been given them by their almost unexampled exposure to sea and storm. The air here is as marine as on the deck of an Atlantic steamer. Every sight and sound tells of the sea, the influence of which is here paramount in every shape.

To a person who has recently left the mainland of Cornwall the islands seem wanting in altitude. The highest point in St. Mary's is only 167 feet above the sea, an elevation not attained in any other island. The rounded granite hills are treeless and bare in their more exposed parts, like the same formation at the Land's End; in some of the islands there is much heath and moorland, which, however, is generally dry, with little of the bog which is so apt to present itself on granite formations. In the valleys and protected homesteads, and often between walls which are multiplied for no other reason than to keep off the wind, a widely different scene presents itself. Myrtles, fuchsias, and geraniums grow with extraordinary luxuriance; palms and aloes are abundant, and in the gardens of Tresco, unprotected except by the configuration of the ground, a mass of tropical vegetation presents itself, which I suppose has no equal in Europe. The visitor might suppose himself, but for the regularity of the planting, to be in a tropical forest, or but for the absence of roof and limitation to be within one of the palm-houses of Kew. The latter impression is assisted at some seasons by the oppressively warm and moist atmosphere. Palms of many kinds abound, including the date palm; Australian palms are numerous and attain great height. Aloes grow in great profusion and luxuriance and bamboo in thickets. Mr. Dorrien Smith, who resides at Tresco, has made it his pleasure to illustrate practically the suitability of this climate for the vegetation of the tropics. Further testimony as to the character of the climate in the valleys is afforded by their early and abundant productions of potatoes and the narcissus, both of which are extensively exported, and the cultivation of which now constitutes the chief industry of these islands.

The mean temperature for the year at St. Mary's is  $52.4^{\circ}$ , which is the highest in the United Kingdom; Guernsey giving  $51.2^{\circ}$ , Penzance  $50.7^{\circ}$ . The coldest month at Scilly is February with a mean of  $45.2^{\circ}$ ; the mean for the three months January, February and March is  $45.3^{\circ}$ , that for Penzance for the same quarter being



## THE CLIMATE OF CORNWALL

MONTHLY MEANS FOR TEN YEARS (1880 TO 1889), OR AS MUCH OF THAT PERIOD AS COULD BE OBTAINED.  
*Highest and Lowest = Absolute Highest and Lowest in Period.*

SCILLY.—Observations for Ten Years, 65 feet above Mean Sea Level. Cornwall Polytechnic, Mr. WILLIAM THOMAS.

MONTH.	Mean Pressure of Atmosphere in Month.	TEMPERATURE OF AIR IN MONTH.						Mean Humidity. in Sun.	Amount of Sunshine.	WIND.					Mean Cloud.	RAIN.		
		Highest.	Lowest.	Monthly Range.	Mean of Highest.	Mean of Lowest.	Mean Daily Range.			Strength.	N.	E.	S.	W.		Days it fell.	Inches.	
Jan.	30.02	55	29	17	48.6	42.2	5.4	45.4	88	...	...	6	7	8	8	...	19	2.56
Feb.	29.95	54	29	17	48.6	41.8	6.8	45.2	87	...	...	5	5	8	8	...	19	2.75
Mar.	29.93	57	31	19	48.9	41.6	7.2	45.3	86	...	...	8	7	7	8	...	18	2.34
April	29.84	59	36	17	51.2	43.7	7.5	47.5	84	...	...	8	8	5	7	...	15	2.21
May	30.00	66	38	18	55.9	47.9	8.0	51.9	84	...	...	7	7	7	8	...	14	1.60
June	30.00	73	40	20	60.8	52.3	8.5	56.6	84	...	...	9	7	7	8	...	13	1.73
July	29.96	75	49	16	64.1	55.5	8.8	70.2	85	...	...	6	2	8	13	...	18	3.03
Aug.	29.97	72	50	15	64.5	56.5	7.9	60.5	86	...	...	7	5	7	8	...	15	1.63
Sept.	29.96	72	44	17	61.8	54.3	7.5	58.1	86	...	...	7	6	7	8	...	17	2.86
Oct.	29.90	65	39	18	56.2	49.4	6.7	52.4	84	...	...	9	7	6	7	...	20	3.02
Nov.	29.89	60	32	17	53.1	47.0	6.1	50.1	85	...	...	6	4	8	10	...	22	3.56
Dec.	29.96	56	32	18	49.9	43.7	6.3	46.8	86	...	...	8	4	7	10	...	22	4.34

<sup>1</sup> For Quarterly and Yearly Means, see page 42.

43.2°. The mean temperature of this, the coldest quarter, is at least 2° higher at Scilly than at any place of which we have record with the single exception of Helston, which approaches somewhat nearer. It is 6° higher than at Norwood. The difference presents itself more strikingly if we have regard to what is more important, the minimum temperature. The lowest temperature at Scilly is reached in the month of March with a mean daily minimum of 41.6°. At Penzance the daily minimum for January, which is there the month of lowest temperature, averages 40.1°. At Norwood the daily minimum, also lowest in January, is for this month 34.4°; a difference of 7° between Scilly and the neighbourhood of London. Taking Guernsey as exceptionally warm and uniform, the January minimum is 39.7°, 2° lower than Scilly. To take a place at the other end of the scale, the January mean minimum at Buxton is 30.0°. The rainfall at Scilly is not so great as in most other parts of Cornwall, though greater than the average in England. The humidity is high; higher indeed than in any other part of the county excepting Helston, which in the record before us shows the same. As much humidity is shown at Guernsey, Ilfracombe, Sidmouth, Killarney and Buxton; more at certain inland places, among which Macclesfield may be mentioned. The information I have obtained with regard to the pathological and therapeutical influence of the locality of Scilly beyond what is due to the results of registration (see page 31), has been from brief personal observation and from conversation with Mr. Moyle, of St. Mary's. The visitor is at once struck with the generally anæmic look of the inhabitants as compared with those on the sea-coast of Cornwall generally; this appears to be a marked instance of what has been termed the marine cachexia. The superabundant moisture of the air and its conspicuously relaxing effect may assist in producing this state. The chief medical interest of this climate turns upon its effects in phthisis and chronic bronchitis. Registration shows that the mortality from phthisis is less than in Cornwall generally, though more than in some districts, notably in those belonging to North Cornwall, of which Camelford and Launceston form the centres. In estimating the mortality from phthisis, it is necessary to consider the bearing upon this item of deaths by drowning. Deaths from this cause occur chiefly in early manhood at about



the same time of life as those from phthisis. From the decennial record from 1871 to 1880 it might be supposed that no less than 6·21 per thousand of the inhabitants of Scilly are put an end to by violence, it must be presumed chiefly by drowning, every year. The corresponding death rate for Cornwall generally is but ·59. If this Scillonian death rate referred only to dwellers in Scilly it would indicate an appalling mortality from accident, and necessarily modify our conclusions with regard to the frequency of disease. Many who were drowned might have died of phthisis had they not been prematurely cut off. But no such allowance is called for. I am enabled by the courtesy of Mr. Moyle, the registrar at St. Mary's, to state that the deaths thus returned are not chiefly of Scillonians or of strangers within their gates, but of what may be termed outsiders, persons who are shipwrecked on their shores or whose bodies are brought to them by the sea. Mr. Moyle considered phthisis to be especially frequent in Scilly, and its frequency to be due to intermarriage. Mr. Moyle states that east winds are felt severely, especially in spring, but the mean of the lowest temperature at this season is 1·6 higher than at Penzance and probably higher than in any part of the British Isles. It is probable that a person familiar with the east wind elsewhere would find its character here much mitigated; it will presently appear that inflammatory affections of the respiratory organs are rare in Scilly, while I have it on the testimony of Mr. Moyle that old age, even over ninety, is not infrequently attained. Thus the east winds would not appear to be such as to greatly encourage bronchitis or be very injurious to the aged.

From the evidence before us, that of Mr. Moyle, and the obvious tendency to anæmia in these islands, I think it must be doubted whether they offer much promise as a resort in phthisis. With regard to diseases of the respiratory organs other than phthisis the case is different. The registrar's reports show a smaller proportion of deaths from these diseases than in any other part of Cornwall, favoured as some parts of the county are in this respect. The deaths attributed to diseases of the respiratory organs in Scilly amount only to 1·59 per thousand per annum, which is lower than in any district of England or Wales, with the single exception of Rothbury, in Northumberland, where the rate is 1·55 per thousand. The general rate for England is 3·76 per

thousand; for Cornwall, as a whole, 2·84. It is probable that the climate of Scilly has a special effect in obviating affections of the respiratory organs other than phthisis; in obviating, in other words, the inflammatory affections, among which bronchitis is the chief. If warmth, equability and humidity be desired, the combination can be found in Scilly in a greater degree than in any other part of the United Kingdom.

With regard to effect of this climate in chronic renal disease, general considerations would lead us to suppose it to be beneficial, but the evidence on this point is insufficient. As a matter of experience, warmth and equability are of more importance in this relation than the absence of humidity.

#### GENERAL CONCLUSIONS.

Rheumatism prevails generally in Cornwall, which, therefore, is to be avoided by persons of rheumatic tendencies. The county as a whole presents influences, probably in the water, which are preventive of urinary stone and gravel.

The interest of Cornwall as a health resort relates chiefly to the coasts. The inland towns will probably be seldom selected by invalids free to choose, unless some special circumstance indicates the avoidance of the sea. The only inland parts which call for notice are the thinly-inhabited uplands, especially those which border upon the moorlands and mountains. The inhabited country about Rough Tor has an altitude of from 600 to 1,000 feet, and has much of the climatic character of Dartmoor: in the winter and spring too cold for comfort, at other times bracing and exhilarating with the well-marked tonic character of mountain air. The beauty and antiquarian interest of the wild moorland about the Cornish mountains, with its prehistoric remains, Druidical and domestic, cannot fail to commend it to some who are as yet ignorant of it, who are content with a summer resort of great natural but few artificial advantages, where men are few and far between, and where one is often invited to forget the present in the contemplation of the past.

The coasts in general appear to favour the development of skin-disease, especially eczema. Anæmia is promoted by some of the maritime districts, notably the Scilly Islands, to a less extent by



the south coast, less or not at all by the north coast. Some of the higher districts of the north coast, such as Bude and Tintagel, appear to have a directly contrary influence, and may be advantageously resorted to by persons suffering from anæmia, exhaustion and prostration. Renal affections attended with albuminuria are generally infrequent on the Cornish coasts, and it may be presumed that the southern resorts are beneficial in chronic disorders of this nature. I have known persons thus affected to do well at Penzance. It would seem that the equability or absence of cold is more advantageous in this respect than the moisture of the air (here not however extreme) is the contrary. With regard to inflammatory affections of the respiratory organs, bronchitis and the like, whether as primary affections or complications, there can be little doubt that the absence of the extremes of cold on the south coast, and more especially in Scilly, tends to minimise these affections in the population and ameliorate them in the individual. If it be desired to secure equability of temperature, in other words the absence of the extremes, both of cold and heat, together with considerable, but not extravagant humidity, the combination is presented best in Scilly, Penzance, or Falmouth. In the respects of equability and humidity, the contrast between these places and the Riviera is striking. It is not necessary to allude to what is sufficiently well known, that some bronchitic and allied affections require a moist air, others a dry one.

The facts furnish two suggestions with regard to the north coast—first, that it is a promising resort for asthmatics, though any resort in asthma is a separate experiment for each case; secondly, and as a larger and more important conclusion, the climate of the north coast, especially of that high level district of which Camelford is the centre, is adverse to the development of tubercle; and it may be well considered whether this district could not be usefully employed, either by way of prolonged visits or permanent residence, by persons with phthisical proclivities or in an early and uncomplicated stage of phthisis.

## THE CLIMATE OF DEVONSHIRE

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AND

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**Definition of District.**—The county of Devonshire is bounded on the north by the Bristol Channel, on the east by Somerset and Dorsetshire, by Cornwall on the west, and by the English Channel on the south and south-east. In point of size it is the third county in England, being only inferior to Yorkshire and Lincolnshire. Its figure is nearly rhomboidal, and in area is 2,493 square miles. Its length from north to south is about 70 miles; its breadth from east to west about 65 miles; its total circumference is 280 miles, of which about 130 are coast-line. For convenience of description the county may be divided into four unequal portions. In each of these the physical characters are so different that the corresponding climatic differences are more easily contrasted. These districts are: 1st, South Devon, comprising the Vale of Exeter and South Hams; 2nd, West Devon; 3rd, North Devon; and 4th, Dartmoor and Exmoor.

**Physical Characters.**—*South Devon.*—In the main this division consists of vale land. The Vale of Exeter in some parts, however, as between Tiverton, Exeter, and Collumpton, has an irregular billowy surface, and presents eminences of considerable altitude, but the central and more southern parts of it preserve the vale character. The area of this district contains about 200 square miles; its boundaries are the hills that range from the heart of Devonshire, north-east towards Somerset, and, sweeping



round towards the south, form a well-defined group in the neighbourhood of Sidmouth. The district called the South Hams is bounded by Dartmoor and the heights of Chudleigh on the north, Plymouth Sound on the west, Tor Bay on the east, and on its southern point the English Channel. This district includes the rich Valley of the Dart, and comprises nearly 250 square miles. It is strikingly diversified by bold eminences, winding coombs or glens, and fine vales. Particularly towards the north the scenery is picturesque and highly romantic. Numerous springs flow from the sides of the hills, and uniting into brooks and rivulets spread luxuriance and beauty through a considerable extent of country.

*West Devon.*—A district bounded on the east by the Dartmoor mountains. It is extremely varied in surface, not only from the number, narrowness and depth of the larger valleys, whose sides generally rise with a steep ascent from the banks of the streams dividing them; but also from the fact that the hills or wide spaces which extend between the valleys, are rent and broken in a very peculiar manner. No part of this district can be strictly called vale, and the level meadows and marsh-lands are of very inconsiderable extent.

*North Devon.*—Comprehends the whole district between Dartmoor and the Bristol Channel, and here also the ground is greatly diversified, and the scenery beautiful. In the neighbourhood of Ilfracombe the hills are of no inconsiderable height, and consist of spurs of that higher land which constitutes Exmoor.

*Dartmoor and Exmoor.*—These are tracts of land of a far different character to those we have hitherto been considering. Dartmoor constitutes a kind of extensive table-land stretching over the greater portion of the western district of Devonshire from the Vale of Exeter nearly to the banks of the Tamar, and consisting mainly of open and uncultivated down, though much of it is now reclaimed by drainage and cultivation. It includes a space of 350,000 acres, about one-seventh part of which is termed Dartmoor Forest, and belongs to the duchy of Cornwall. This elevated tract is of an irregular form, broken into numerous minor hills, many of them crowned by picturesque groups of granite rocks, provincially called "Tors," and for the most part consists of a wild mixture of heath, bog, rock, and rapid streams,

whence some of the principal rivers of Devon arise: notably the Dart, the Teign, the Taw, and the Tay. Yes Tor, apparently the highest point of the elevated land, rises 2,050 feet above the level of the sea; there are many other mountains nearly as high. Dartmoor is the principal metalliferous district of Devon, and affords large quantities of most of the useful metals. Exmoor—though the major portion of the district is in Somerset—may be considered in this connection. It is a wild and sterile range of country in the extreme north of Devonshire and the adjacent portion of Somerset. The highest portion of Exmoor is Dunkery Beacon, to the South of Porlock, which rises to 1,668 feet. The general characteristics are similar to those of Dartmoor. The river Exe rises on Exmoor, to which it gives the name.

**Summary.**—The chief characters of Devonshire, therefore, depend upon the three elevated tracts—Exmoor in the north, the Sidmouth hills in the east, and Dartmoor in the south-west central portion. Between these tracts the land slopes more or less precipitously—as the swiftness and direction of the flow of the rivers readily show—towards the coast-lines on the north, south and south-east. Nevertheless, even the valleys are much broken up, and throughout the county flat-land is conspicuous by its absence.

**Protection from Winds and Exposure.**—It follows from the description given above that Dartmoor, Exmoor, and the Sidmouth hills are exposed to winds from all quarters, though we shall later on consider in detail the actual prevalence of certain winds. South Devon, as a whole, is protected from northerly and north-easterly winds, while those from the west, south, south-west, and south-east are unobstructed. North and West Devon are protected on the east and north-east, while they are exposed on all other sides. Such differences as show themselves between places in North and South Devon will be found under the head of each particular resort.

**Geological Formation.**—From the confused intermixture of the strata in Devonshire the operation of earthquakes and volcanoes is strikingly apparent. Granite occupies the central and most elevated portion of the county, including the whole forest of Dartmoor and a large district around it. Laminated schist is common throughout the county; most of the thin laminae



are very rotten and quickly disintegrate into mud, but the thicker beds are sometimes sufficiently hard to be used in building. Slate occupies an extensive surface on the northern, southern, and eastern parts, and is quarried in large quantities for roofing purposes. Transition limestone occurs in several detached parts, but principally in the south, between Torbay and Plymouth; the whole coast between these points is composed of this rock. Marble is found in considerable quantity, and forms the greater part of the south and south-east coast. It is largely used for ornamental purposes. Red sandstone occupies the district immediately around Exeter, and the green-sand formation presents on the confines of Devon and Dorsetshire many outlying masses forming considerable hills. Lignite, or woodcoal, clays, white quartz and sand, with many other heterogeneous formations are also found in various parts of the county. Tin, manganese, antimony, copper, and argentiferous lead, with hematite iron are the minerals found in sufficient abundance to pay for working.

**Soil.**—The soils of Devonshire are extremely various, but may be generally characterised according to the rock or stratified substances which they cover as granitic, slatey, calcareous, arenaceous, argillaceous, gravelly, and loamy. The poorest is that covering the granite of Dartmoor; the richest is that in the South Hams, occurring in contiguity with limestone and sandstone rocks, and this soil is exceeded by few tracts in the whole kingdom in fertility. The red colour which characterises the soil is due to an abundant admixture of iron in a highly oxydised state. This red earth, which is found largely in the neighbourhood of Torquay, is the foundation of the terra-cotta pottery industry. A large portion of West Devon is sandy or gravelly, while part of North Devon is clay.

**Natural Drainage.**—The configuration of Devonshire is such as to provide very efficient natural drainage: this is effected by the Taw and Torridge rivers on the north, and the Dart, Teign, Exe, and Tamar on the south. Except to a slight extent on the moors there is absolutely no standing water to be found in the county.

**Trees, Vegetation.**—Outside the barrier presented by the elevated ridges above mentioned, the herbage is scanty, the trees stunted, and to the south-west stripped of wood and foliage owing

to the unbroken violence of the south-west winds: while on the moors themselves trees are the exception, and heath and wild fern are the chief growths. In the vale-land the hedgerows are thickly studded with elms in the valley of the Exe, and with oaks in the Silurian slate districts, through which the North-Devon Railway passes: orange and lemon trees, myrtles of twelve to fifteen feet in height, laurels and bays flourish in the open air; apple trees are largely cultivated for the manufacture of cider, and all the cereals grow luxuriantly, while in many parts the land is particularly valuable for grazing purposes. These results of a mild climate and a moist and rich soil are especially noticed in South Devon, and of South Devon principally in the neighbourhood of Torquay.

**Ocean Currents.**—In common with the rest of south-west England and Ireland, Devonshire is situated in the path of the Gulf Stream after its bifurcation: to that fact is due the absence of very cold winters and the considerable prevalence of south-west winds, while, as we shall see, it also serves to explain the excessive rainfall on the moors.

**Climate.**—The climate of Devonshire as a whole is mild and moist, and may be described in one word as "oceanic" in character, owing to the promontorial projection of the county (with Cornwall) into the Atlantic. But on closer inspection three more or less distinct classes of climate can be differentiated; found in the south, in the north, and on the moors, and depending intrinsically upon the physical characters of those same districts. For our purpose it is now necessary to consider each of these classes of climate in detail.

**I. Climate of South Devon.**—Even in the district of South Devon, on account of the varied situations of towns, there is no absolute uniformity of climate to be found even in places but a few miles distant from one another. Nevertheless, it is possible to give a series of figures which shall act more or less as a type of South-Devon climates, but which in one or more particular details must be modified for each individual resort. To obtain this type, three places—Exeter, Plymouth, and Torquay—have been especially considered; Exeter representing a fairly exposed inland town, Plymouth an exposed seaport town, and Torquay a very sheltered seaside resort. A condensed summary of the climatological conditions of these three places shows



that South Devon has a moist, somewhat relaxing climate. The average barometric pressure is rather low (29·84 inches); this is accompanied by a high average rainfall (32·5 inches); while rain falls on almost exactly half the number of days in the year. The amount of cloud is represented by 5·8 (intermediate figures between 0·10 being used to express the range of degree of cloud). This would indicate that the amount of sunshine is not particularly great, nevertheless this very presence of cloud is a means of preventing excessive loss of heat from the earth's surface by radiation so that we should expect to find that not only is the average yearly temperature high, but also the range of temperature is not great. This indeed is the case; the average yearly temperature is 50° and the range only 12°·3. The average maximum temperature is 56°·5 and the average minimum 44°·2. The importance of the smallness of range is great, as it shows that very cold nights do not follow on very warm days. The range is still less during the months November to February, being 9°·4. The winds are chiefly from the west and south-west, which actually prevail through every month of the year, nevertheless in March, April, and May, north, north-easterly, and easterly winds increase in comparative frequency, and render these months somewhat trying—though on account of the facilities of obtaining shelter in South Devon, they are far less trying than in other parts of the country. The strength of wind (estimated from 0—6) is 1·6, which indicates that light breezes are the type. The particular advantage of South Devon, however, is best shown by a consideration of some of the seasonal characteristics. Compared with Greenwich the seasonal mean temperatures are,

	Spring.	Summer.	Autumn.	Winter.
South Devon . . . . .	47°·6 . . . . .	60°·1 . . . . .	51° . . . . .	41°·5
Greenwich . . . . .	47° . . . . .	60°·7 . . . . .	50° . . . . .	38°·4

So that while cooler in summer South Devon is considerably warmer in winter, and slightly so in spring.<sup>1</sup> Speaking generally, late autumn to early spring is the period of greatest rainfall, as also that during which rain falls on most days. Nevertheless

<sup>1</sup> Spring is taken to consist of the months March, April, May; Summer, June, July, and August; Autumn, September, October, November, and Winter, December, January, and February.

it is not common to have a day unceasingly wet, except perhaps on the sea-coast. In respect of rain, Exeter is far more favourably off than either Plymouth or Torquay: the average humidity of these three places is 80·4 per cent., 84·7 per cent., and 82·3 per cent., respectively. This example of the rainfall shows admirably how in each case the "type" has to be departed from. Plymouth is situated directly in the course of the Gulf-stream, with its attendant rain-bringing winds; Exeter receives chiefly westerly and south-westerly winds which have already yielded up a large portion of their moisture on Dartmoor. These form the two extremes: Torquay, free from both of these determining circumstances, gives a humidity almost exactly the mean of the other two. Fogs are rarely met with in South Devon, though in late autumn and winter very wetting mists rise in early morning and in the evening. The dews also are apt to be very heavy, and necessitate some care in ventilating the bedroom, and in the choice of a morning walk. Severe frosts occasionally occur, but are not of long duration—and it is not common for the temperature to be much below the freezing point during the day-time, even in a winter of considerable severity. These characteristics impress upon the climate of South Devon one more peculiarity besides those of moistness and warmth; it is that of equability, and from a therapeutic point of view it is impossible to lay too much stress on this most valuable quality of the climate.

**II. Climate of North Devon.**—To get information as accurate as possible concerning the climate of North Devon, which might serve as a fair criterion for any place in the district, be it on the coast or inland, it has been thought advisable to concentrate attention on the town of Barnstaple. Barnstaple lies six miles from the coast, on the banks of the river Taw, and is surrounded except on the seaward aspect by a semicircle of hills. It is thus admirably adapted from its situation for our purpose, and the more so as exhaustive meteorological statistics have been taken at the Athenæum in the town for the last thirty-three years. By the kindness of the Athenæum committee we have gained access to these statistics, and the following conclusions are based entirely upon the material thus placed at our disposal. Our investigations, the results of which will be found in a tabulated form on page 91, extend over a period of fifteen



years, viz., 1858-1872, or sufficiently long to eliminate any serious cause of error.

The climate of North Devon is *mild*, the average yearly temperature being  $51^{\circ}1$ ; and *moist*, the average humidity being 82.1, rainfall 40.38 inches, and the number of days on which rain fell, 192.3. The prevailing winds are from the south-west, which average seventy-two days per annum, west averaging fifty-nine days per annum, and north-west fifty-two days per annum. These winds consequently account for 183 days, or almost exactly fifty per cent. of the year. South-east winds come next with fifty days, and south with forty-four days, while north, north-east, and east winds only account for eighty-seven days between them. The winds, therefore, are mainly of the moist and balmy type; moreover, since those winds have travelled over large tracts of water before they impinge upon the land, they are more equable in temperature than the others and impress upon the climate of North Devon, as was also seen to be the case with South Devon, its chief characteristic of equability. The tendency of the winds in the main is to light breezes, the average strength being 1.45; nor does this average vary much throughout the year. It is of course understood that this holds only for sheltered places such as Barnstaple; on the high land the average strength is much greater. The rainfall is almost excessive, and is 25 per cent. greater than at Exeter, but the westerly breezes which also prevail at Exeter have been able to part with a considerable amount of their moisture before reaching that city, and the difference between the average rainfall is only to be expected. In spite of the amount of rain, however, in North Devon the amount of cloud is only 4.07 on an average, and the sunshine is thus seen to be present to a very fair extent. Actual facts in this direction cannot be given as no record of sunshine has been kept at Barnstaple. The rain mostly comes down in heavy showers of short duration, after which the clouds clear away, and the sun quickly dries the land. This, however, holds only in summer, as in winter drizzling rains with dull gray skies are very common. The amount of rain is fairly evenly distributed throughout the year, the greatest differences being between May and October, in which months the rainfall is 2.32 inches and 4.98 inches respectively. Nevertheless, in May, the driest month of the year, rain falls on an

average on eleven days. Along with this comparative freedom from rain comes the prevalence of north-east winds: yet it is curious that east winds, which are usually unaccompanied by rain, are in North Devon commonest in October.

Taking the months December, January, and February, as constituting winter; March, April, May, as spring; June, July, August, as summer; and September, October, and November, as winter, we find that the average temperatures for these seasons compared with those of Greenwich are as below:

	Spring.	Summer.	Autumn.	Winter.
North Devon . . . .	49°·2 . . . .	59°·2 . . . .	51°·8 . . . .	42°·8
Greenwich . . . .	47° . . . .	60°·7 . . . .	50° . . . .	38°·4

The differences are not great except during winter, when a difference of  $4\frac{1}{2}$  degrees obtains. A better comparison is afforded by considering the fact that the range from winter to summer is in North Devon only 16°·4 against 22°·3 at Greenwich, another fact demonstrating the equability of the climate. The chief increments of temperature obtain between March and April, and between May and June. The decrements are greatest between September and October, and October and November. Consequently the periods of greatest change of temperature are spring and autumn as above defined, and in this respect they differ in degree only from other parts of the kingdom. Extremely low temperatures are occasionally recorded, such as 8° F. on January 15th, 1867, but such extreme degrees of cold are very rare, and the average of all the lowest temperatures recorded in the months of December and January during the fifteen years is 23°·85 or 8° of frost, while the wet bulb was frozen during the same period on ninety-three occasions: nevertheless February, and to a much less degree, March, are also accountable for some severe frosts which have not been included in the above numbers. The monthly range of temperature, important as indicating the difference between day and night temperatures, is not great, varying from 9°·6 in December and January, to 17° in May. In the summer season it is 16°·1.

**III. Climate of the Moors.**—The climate of the moors is in very great contrast to that of the districts we have hitherto been considering. Cold and damp throughout the year, with an excessive rainfall and a low average temperature,



subject to fogs and very wetting mists, except in the height of summer, they are occasionally the subject of a scorching sun, while the wind varies in strength from a perfect hurricane to complete calm. Even during July and August a fire is necessary in the evening to counteract the chilling influence of the fogs which prevail then as throughout the rest of the year, though not of course to the same extent as in the late autumn and winter months. Severe frosts in winter are common, the thermometer registering frequently  $12^{\circ}$  to  $14^{\circ}$  of frost, while snow covers the moors at times for days together. Nevertheless the climate, such as it is, would be far more severe were it not for the considerable prevalence of cloud, which hinders radiation from the earth. Thunderstorms are frequent, and are accompanied with perfect deluges of rain, the sun, however, is often shining at the same time, and rainbows are frequently to be seen on the moors in the highest perfection. The total rainfall as given in the meteorological table on page 77 is fairly correct as an average, but varies within extremely wide limits. In August, 1891, for example, though the average given for 1885—9 is 6·93 inches, from information received from Dr. Stone of the Convict Prison, we hear that 14·17 inches fell, while the average number of days on which rain falls is, according to his account, considerably understated. He informs us that Dartmoor has on the average 319 wet days in the year. Dr. Stone is the authority from whom the Meteorological Society receives information, and from that information our table has been compiled. In all probability further experience in taking climatological data would now make this observer modify considerably some of his earlier observations, and evidence goes to show that he understated rather than overstated facts. Nevertheless it must be remembered that the period 1885—9 includes the exceptionally dry year 1887, the effect of which could only be slightly modified in so short a series of years. Exmoor differs but little from Dartmoor, but has even a greater annual rainfall, though no statistics are available.

**Summary.**—The climate of Devonshire may be summarised thus. It is soft, warm, mild, calm, equable, free from storms and essentially oceanic. Though subject to rather a large average rainfall (which varies, however, in different districts within wide limits) except on the moors, rain seldom continues unceasingly through a

whole day. In winter the weather is not for long inclement, frosts being rare and soon over. The air, though humid, is neither cold nor raw, it is warm, moist, and still, with a gray sky ("muggy"). Occasionally cold days do, however, occur, and severe frosts are noted on one or two days every year, though only about once in every five years is the temperature sufficiently low to freeze the rivers. On the moors, however, this mildness of winter is not found, and the temperature here is often as severe as in the Highlands of Scotland. In *spring* the easterly winds prevail, along with bright sunshine and a low degree of humidity, and on that account greater evaporation from the body is allowed, giving the sensation of a lower degree of temperature than actually exists. The sky is markedly clearer than in winter, nevertheless the colder north, north-east, and east winds, intermingling with the warmer south, south-west, and westerly winds, produce sudden overclouding, with downpours of rain, which, however, quickly give place to returning sunshine. The vegetation is quickly forced by this kind of climate, and in this respect the change from winter to summer is rapidly made. The evenings and nights are cold and damp, but nevertheless the whole spring temperature is  $2^{\circ}$  higher than that of London. In *summer* the breezes are light; the rainfall at its lowest, though the humidity rises somewhat; the average temperature is about  $2^{\circ}$  below that of London, and in July and August the evenings are so mild that outdoor lounging is as safe as it is pleasant. Nevertheless on the moors, evening is often cold and damp, rendering a fire more than a mere matter of comfort. The extreme heat of the sun, inland, is largely mitigated by the prevalence of cloud; this, however, does not obtain to anything like the same extent on the coast line. *Autumn* is the period of greatest rainfall, but as in spring, the rains are heavy and of short duration, so that the actual number of rainy days is not greater than in winter. Fogs and mists are most prevalent during the latter part of this season, and a regular alternation of dry and rainy days is not uncommon. In short, Devonshire is a microcosm in itself as far as climate is concerned, and offers all varieties from the cold, bracing, and invigorating strong breezes of the moors, to the equable, still, and mild, gentle breezes of such places as Torquay, while the railways afford facilities for easily changing quarters from north to south. Even within smaller areas differences



obtain. Thus at Lynton the funicular railway on the face of the cliff or steep hill-side allows those who find Lynton too cold to secure warmth and shelter (in two minutes) at Lynmouth, or when Lynmouth is found to be close and airless, the same mountain line lifts one 500 feet to the elevated valley of rocks. The climate of Babbacombe, too, is markedly more bracing than that of Torquay, from which it is distant only two miles. On the moors themselves similar differences are found, the ridge of Haldon, for example, behind Dawlish and Teignmouth, being far less bleak and humid than Dartmoor. The rainfall on the moors too, though everywhere excessive, shows a certain amount of variation at different places.

We now come to the consideration of the individual characteristics of limited districts and resorts. It will conduce to clearness and brevity if again we consider South Devon apart from North Devon, and for convenience of reference the various places will be given in alphabetical order.

#### ASHBURTON.

Ashburton, a large village situated in a valley surrounded by hills, half a mile from the river Dart and twenty miles south-west of Exeter. Although only a few feet above the sea-level, it has constant fresh breezes from the south-west and south-east. The rainfall is high, in common with South Devonshire generally. Anæmia and eczema are the two most prevalent diseases, together with rheumatism amongst the aged.

#### DARTMOUTH.

Dartmouth is situated on the south-east coast of Devon, and on the acclivity of an eminence gradually sloping from the margin of the water; the streets are ranged in terraces rising at different elevations. Dartmouth is sheltered from the west and south-west, but faces east, and is in February and March, from this cause, often trying. These are the months when old people are carried off; on looking casually at the Register of Deaths, six consecutive cases were noted in which the ages were 82, 87, 88, 68, 81, 69. The mortality above sixty years is fully one-third of the whole. In 1889 there were 168 days on which rain fell, and a total rain-

# METEOROLOGY OF DARTMOOR

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DARTMOOR.—Meteorological Statistics. Averages of Five Years (1885—1889).

MONTH.	Barometer.	TEMPERATURE.			Temperature of Air, mean.	Dew-point.	Mean Degree of Humidity.	Days on which Rain fell.	Average Amount of Rainfall.	Average Cloud (0—10).	Strength of Wind.	N.	N.E.	N.W.	E.	S.	S.E.	S.W.	Average in Days.	Average in Days.	Average in Days.	Prevailing Wind.
		Mean of Highest.	Mean of Lowest.	Range.					Inches.			Average in Days.	Average in Days.	Average in Days.	Average in Days.	Average in Days.	Average in Days.	Average in Days.	Average in Days.	Average in Days.	Average in Days.	
Jan.	No statistics taken.	41.5	31.7	9.8	36.5	No statistics taken.			21.0	5.10	No statistics taken.			2.4	3.8	6.8	4.5	1.3	2.3	7.3	2.5	S.W.
Feb.		40.1	29.5	10.6	35.1		92.6	18.8	5.51	7.80		1.7	5.7	4.5	5.0	0.5	2.0	0.5	1.7	7.1	1.7	S.W.
Mar.		40.3	28.8	11.5	35.4		83.3	16.5	6.27	9.33		2.2	6.5	5.6	4.0	2.3	3.1	3.1	1.6	5.5	1.6	N.E.
April		46.9	33.1	13.5	40.3		85.0	17.3	2.77	7.08		2.1	6.4	6.8	3.8	0.3	3.0	0.3	1.4	4.8	1.4	N.W.
May		53.9	38.4	15.5	46.7		83.3	16.0	4.33	6.48		2.8	3.4	5.0	2.4	1.1	5.4	1.1	4.2	5.4	4.2	(S.E.) S.W.
June		61.8	44.9	16.9	53.2		88.0	10.3	2.25	5.95		1.6	5.6	4.6	4.8	0.2	2.8	0.2	2.7	7.4	2.7	S.W.
July		64.8	51.7	13.1	58.6		85.6	17.0	8.10	6.10		2.9	2.3	5.9	1.4	1.1	2.6	1.1	3.4	7.9	3.4	S.W.
Aug.		64.1	51.0	13.1	58.1		87.8	16.6	6.93	6.42		1.8	1.7	6.1	2.0	1.8	1.2	1.8	3.1	10.3	3.1	S.W.
Sept.		59.7	44.8	14.9	52.0		86.8	13.2	6.68	6.56		1.8	3.5	3.8	2.5	1.4	4.7	1.4	1.3	6.8	1.3	S.W.
Oct.		50.5	37.6	12.9	48.9		86.8	19.4	8.67	7.32		2.7	6.7	4.5	2.0	0.8	3.7	0.8	3.0	5.3	3.0	N.E.
Nov.		48.7	37.2	11.5	43.2		93.0	23.4	8.99	8.38		1.6	3.4	4.2	2.1	0.4	3.3	0.4	3.1	7.7	3.1	S.W.
Dec.		41.1	32.0	9.1	38.8		91.8	19.8	6.62	7.22		1.7	2.5	5.5	2.4	1.0	2.8	1.0	2.2	7.6	2.2	S.W.
Average of Year.	...	51.1	38.4	12.7	45.6	...	87.9	209.3	72.22	7.19	...	25.3	51.5	63.3	36.9	12.2	36.9	12.2	30.5	83.1	30.5	...
								Total	Total	Total		*Total	Total	Total	Total	Total	Total	Total	Total	Total	Total	*Total

NOTE.—This Table is not given as reliable to the same degree as those for South and North Devon : observations on Dartmoor only date from 1885. The rainfall and temperature values are the most reliable, open only to objection owing to the small period considered ; the deficit in the number of days in the columns between the two asterisks is due to faulty observation in 1885. The values are only relatively true.



fall of 31·63 inches. The drainage is by sewers, flushed at each high-tide with the store-water from the hills. The water supply is not constant, and during a dry summer becomes scarce. It is derived from the hills, is of excellent quality, and is extremely soft.

#### DAWLISH.

Dawlish lies in a valley open on the east to the English Channel, and bounded on the west by a richly-cultivated line of hills. The position of Dawlish leaves it open to the few east winds prevalent during the year. Except at those times the strength of wind is very low. The beach is sandy and excellent, and as a whole the resort is one very favourable to children. The drainage system three years ago was completely changed, and now consists of sewers, periodically flushed, which carry the refuse one and a-half miles from the town, and discharge it into the sea a quarter of a mile from the high-water mark. The water-supply is continuous, and is derived from the hills: before reaching the reservoirs it is well filtered, and is distributed by two service pipes from the reservoirs by the force of gravity. The mortality above sixty years in 1890 was 46 per cent. of the total mortality, and in 1887 reached 56 per cent. of the total. The death-rate from phthisis is rather high, owing to the fact that many of the resident families have become such, on account of the delicacy of chest of some of their members.

#### EXETER.

Exeter is a compact, densely inhabited city occupying the summit and declivity of a ridge-like hill, which rises from the east bank of the Exe to a height of 150 feet. The city is open on the south-east, but otherwise sheltered. "The chief characteristics of the climate of Exeter are those of being warm, soft, mild, equable, calm, and free from storms; and though subject to a large share of rain, it seldom occurs that a day is so unceasingly wet as not to afford some hours for out-door exercise."<sup>1</sup> Further meteorological statistics are given in the special table for Exeter upon the opposite page. Of the total mortality, about one-third (or rather over) of the deaths are in persons above the age of sixty years.

<sup>1</sup> *Climate of the South of Devon.* Dr. T. Shapter.

# METEOROLOGY OF EXETER

79

EXETER.—Meteorological Statistics. After Dr. THOMAS SHAPTER. (Modified.)

Month.	Barometer (corrected).	TEMPERATURE.				Temp. of Air, Mean.	Dew-Point.	Mean Humidity.	Days on which Rain fell.	Average Amount of Rainfall.	Average Cloud (0-10).	Strength of Wind (0-6).	N.		N.E.		N.W.		S.		S.E.		S.W.		W.		Prevailing Wind.
		Mean of Highest.	Mean of Lowest.	Range.									φ	φ	φ	φ	φ	φ	φ	φ	φ	φ	φ	φ	φ	φ	
Jan.	29.940	44.5	35.1	9.4	39.2	36.6	31.8	8	18.4	2.98	5.5	2.0	3.8	3.8	6.1	5.3	3.9	2.4	2.8	2.8	2.8	2.8	2.8	2.8	3.8	3.8	N.E.
Feb.	30.066	46.3	36.2	10.1	40.6	37.7	30.7	12.7	1.90	4.3	2.1	2.2	2.2	2.2	3.1	4.5	1.5	2.3	3.6	4.3	3.6	4.3	3.6	4.3	6.9	6.9	W.
Mar.	30.043	49.4	37.2	12.2	42.6	37.6	33.4	11.9	1.97	3.9	2.1	2.3	2.3	2.3	4.5	5.6	4.0	1.7	3.7	2.6	3.7	2.6	3.7	2.6	6.5	6.5	W.
Apr.	29.931	55.3	40.5	14.8	48.4	42.0	29.9	13.7	2.58	3.9	2.1	4.1	4.1	4.1	3.4	4.6	2.9	2.9	4.0	2.3	4.0	2.3	4.0	2.3	5.6	5.6	W.
May	29.945	62.5	46.2	16.3	55.7	47.4	25.5	14.3	2.29	3.4	1.9	2.1	2.1	2.1	5.0	4.7	3.0	4.4	5.5	2.6	3.7	2.6	3.7	2.6	3.7	3.7	S.E.
June	29.996	67.9	51.8	16.1	61.0	52.4	24.8	14.2	2.45	3.5	1.8	1.9	2.0	2.0	3.6	5.0	1.4	3.0	3.7	4.3	3.7	4.3	3.7	4.3	7.4	7.4	W.
July	30.025	70.7	54.5	16.2	63.1	54.4	24.6	13.8	2.07	3.8	1.7	2.0	2.0	2.0	3.6	5.2	1.6	4.1	4.4	3.5	4.4	3.5	4.4	3.5	4.4	4.2	N.W.
Aug.	30.000	69.7	53.9	15.8	62.4	54.1	24.1	14.2	2.11	3.2	1.7	2.5	2.5	2.5	3.5	4.6	0.8	3.9	2.4	4.7	3.9	2.4	4.7	3.9	6.4	6.4	W.
Sept.	30.037	64.6	50.2	14.4	57.4	50.9	20.0	12.3	2.45	3.1	1.9	1.9	1.9	1.9	2.6	4.0	3.0	3.7	2.9	5.2	3.7	2.9	5.2	3.7	6.5	6.5	W.
Oct.	29.902	57.6	45.4	12.2	50.5	46.3	33.9	18.7	3.23	4.5	1.8	3.4	3.4	3.4	1.2	3.5	2.4	5.6	3.2	5.5	3.2	5.5	3.2	5.5	7.0	7.0	W.
Nov.	29.979	50.9	40.3	10.6	44.9	42.1	30.7	14.4	2.35	5.2	1.6	3.5	3.5	3.5	3.4	4.8	2.2	2.6	2.7	3.2	2.7	3.2	2.7	3.2	7.6	7.6	W.
Dec.	29.987	46.7	39.6	7.1	42.0	39.1	30.4	15.3	3.04	5.5	2.0	2.8	2.8	2.8	4.0	4.4	2.1	3.7	2.7	4.5	2.7	4.5	2.7	4.5	7.0	7.0	W.
Aver- age of Year.	29.988	57.1	44.0	13.1	50.6	45.1	30.4	173.4	29.34	4.12	1.9	32.5	Total	Total	Total	Total	Total	Total	Total	Total	Total	Total	Total	Total	Total	Total	Total

NOTE.—The above Table does not appear in Shapter's *Climate of the South of Devon*; the figures do appear, scattered throughout the body of the work; they are arranged as above for convenience of comparison.

\* Years 1849-60. † Years 1824-53. ‡ Period of 19 years. § Years 1818-57. ¶ Duration of period not given. † 1895-34; side note, p. 18 of the work.



The prevalence of diseases does not vary to any considerable extent from that obtaining in South Devon generally (*q.v. infra*). In comparison with Barnstaple the following points may be indicated: (1) The average temperature, rainfall, and degree of humidity are less at Exeter; (2) the prevalence of west and north-west, north and north-east winds, together with the average strength of wind, are greater at Exeter. These peculiarities in the winds are due to two facts—the height above sea-level of Exeter, and the precipitous sloping of the town on the south-west and north-west.

#### NEWTON ABBOT.

Newton Abbot lies low and is surrounded by hills on all sides. The houses, at a little distance from the town, built on the sides of these hills, are, however, in every way advantageously situated. The Medical Officer of Health for the Newton Abbot (rural) Sanitary District informs us that in the miocene lake basin (the only one in England), whence the clay is obtained for the Aller Vale and other potteries of the district, malarial affections were formerly prevalent; but, since the construction of the canal and drainage works ague has disappeared, but those who have suffered from Tropical ague are apt, if resident in the basin, to suffer from a renewal of malarial affections. He also states—and his statement is supported by statistics—that disorders of a degenerative type, especially apoplexy, are found to occur about ten years later in life on the moor-land than in the lower lying portions of his field of observation. This is attributable, not only to the more invigorating climate of the high moor-land, but also to the active life and often scanty food of the inhabitants. In the valleys where the air is not stimulating a tendency to inactivity and over-feeding, promotive of degenerative change, is apt to occur. Vital effectiveness, or power to resist the onset of disease, is much higher among the denizens of the moor than of the plains. When living for several weeks on a hill above Newton Abbot a great contrast between the distribution of cloud and sunshine was often apparent. Over the sea the sky might be clear and almost cloudless, whilst over the Haldon and Dartmoor Tors it was generally cloudy. Thus, when too glaring out at sea, or on the coast, inland the shade afforded by the cloud was often most grateful and kept the vegeta-

tion from being burnt up in spite of a total absence of rain. The average rainfall for Newton Abbot itself is 40·86 inches, of which by far the greater part falls in the months October—February. The chief causes of death are respiratory—especially bronchitis, pneumonia, and phthisis. There is a large proportion of people above the age of sixty, and they look as a rule much younger than their age. The system of drainage, owing to want of fall, is “very bad,” the lower parts of the town after heavy rains and at springtides being often flooded; mason-work drains are largely in use, and the general disposal of sewage is bad, as it is made to collect in “catchpits.” The water-supply is good and constant, being brought in iron pipes from Dartmoor, but is not universal; wells are very commonly used in the old parts of the town.

#### PLYMOUTH.

Plymouth, with Devonport and Stonehouse, is situated at the extreme south-west corner of Devonshire. The town is situated on a promontory which projects into Plymouth Sound, and is separated from the mainland on the west by the estuary of the Tamar, which forms the harbour called the Hamoaze, and on the east by a creek called the Catwater. Devonport is about two miles west-north-west of Plymouth, and is connected with Stonehouse by a bridge. The site of Plymouth ascends in a bold and broken gradient from the sea coast, and is such as to render some of the street lines steep and the entrance from the north-east difficult. Devonport stands very high, and is built chiefly around the Hamoaze. As a whole Plymouth with its suburbs is well built, but most of the older streets are narrow, short, irregular, and ill-constructed. The drainage is by main sewers which discharge into the sea, and are partially ventilated in the streets.<sup>1</sup> The water-supply is as a rule constant, and the water is soft and very pure, having a very small percentage of salts. The average yearly temperature of Plymouth is 50°, and the prevailing winds are from the west and south-west. These are accompanied by a large average number of days on which rain falls (190), and a high average amount of cloud (6·7). The strength of wind, however,

<sup>1</sup> The present system of sewers is very old and is being gradually replaced by a larger and better constructed system.



## THE CLIMATE OF DEVONSHIRE

PLYMOUTH.—Meteorological Statistics. Averages of Ten Years (1880—1889 inclusive).

Month.	Barometer (corrected).	TEMPERATURE.			Temp. of Air, Mean.	Dew-point.	Mean Degree of Humidity.	Days on which Rain fell.	Average Amount of Rainfall. Inches.	Average Cloud (0—10).	Strength of Wind (0—9).	N. Average in Days.	E. Average in Days.	S. Average in Days.	W. Average in Days.	Prevailing Wind.
		Mean of Highest.	Mean of Lowest.	Range.												
January . . .	30.043	45.6	36.2	9.4	40.9	38.6	91.9	17.4	2.62	7.7	1.35	4.4	8.4	7.6	9.3	W.
February . . .	29.998	47.3	37.1	9.1	42.1	39.1	89.6	15.4	2.51	7.3	1.50	6.3	8.2	6.4	7.3	E.
March . . .	29.835	49.1	37.3	11.8	42.8	38.7	85.1	14.4	2.72	6.3	1.51	7.3	9.1	6.0	8.5	E.
April . . .	29.841	54.1	41.2	12.9	46.6	41.2	81.7	13.1	2.12	6.3	1.61	7.1	9.6	6.5	6.6	E.
May . . .	29.950	60.3	46.5	13.8	52.6	46.2	78.0	12.6	1.87	6.2	1.48	7.0	9.1	6.5	8.2	E.
June . . .	29.945	66.3	52.0	14.3	57.6	50.7	78.3	13.0	1.90	6.2	1.38	7.7	4.7	7.1	10.3	W.
July . . .	29.886	68.6	55.0	13.6	60.6	54.9	81.8	16.4	2.93	6.6	1.40	5.4	4.6	10.1	10.7	W.
August . . .	29.911	68.2	54.6	13.6	60.6	54.9	82.1	13.6	2.01	6.3	1.38	6.7	5.8	6.9	11.6	W.
September . . .	29.925	63.4	51.7	12.3	56.6	52.2	84.7	16.0	3.19	6.1	1.30	7.1	6.6	6.7	9.4	W.
October . . .	29.855	56.1	44.2	11.9	49.7	45.4	85.5	18.8	3.93	6.7	1.37	8.0	8.2	6.6	7.9	E.
November . . .	29.750	52.0	42.1	9.9	46.9	43.7	89.6	19.6	3.96	7.3	1.45	5.2	6.3	7.7	10.7	W.
December . . .	29.940	47.8	37.7	10.1	42.9	39.5	87.7	19.8	3.67	7.3	1.24	6.4	6.3	7.9	10.3	W.
Average of Year	29.907	56.5	44.6	11.9	50.0	45.4	84.7	190.1 Total	33.43 Total	6.7	1.41	78.6 Total	86.9 Total	86.0 Total	110.8 Total	

is not great (1·4), and the yearly rainfall is not considerable for Devonshire (33·4 inches). The humidity is greater (84·7) than at either Torquay (82·3) or Exeter (80·4). Plymouth must therefore be considered as a moist and humid town, as subject, in short, to damp, cloudy, warm days on which but little wind is stirring. In the early portion of the year (February to May, both inclusive) and again in October, east winds prevail with a low rainfall (except in October). Autumn and early winter are the seasons in which the greater part of the rain falls, and in which fogs are most prevalent. Continuous snow and severe frost are rarely met with.

#### SIDMOUTH.

Sidmouth is situated at the south-east corner of Devonshire, and is surrounded by a semi-circle of hills particularly on the north and east. It is protected, therefore, from all but balmy and moist winds and has a typical south Devonshire climate. The sunshine in winter is greater in amount than the average of those places on the south coast where sunshine records are made (St. Leonards, Brighton, Eastbourne, Southbourne, Ventnor, Rousdon, and Torquay). Thus in 1890, Sidmouth, from April to September inclusive, had 96 hours *less*, but from October to December, with January and February, 1891, had 68 hours *more* than the south coast average. This includes a December which had only 20 hours instead of an average 56 hours sunshine, and on an average Sidmouth enjoys more than 20 per cent. above the south coast winter average (Dr. Oliver of Harrogate). The rainfall is 26 per cent. below that of the rest of Devonshire (humidity 83). In common with the rest of the South Devon coast, the temperature is lower in summer than Greenwich, but higher in winter, about 2° in each case. The drainage is by sewers with ample periodical flushing and an outfall into the sea below high water mark. The water is obtained from the Greensand Hills in the north-east, is well filtered, and of exceptionally good quality. The most common cause of death is chronic albuminuria, with its cerebral and other complications; about one-third of the deaths are in persons over the age of 70. The climate is particularly favourable for mixed catarrhal and cardiac forms of asthma, bronchitis, and the so-called Indian cachexia.



By reason of the importance of certain remarks by Dr. Oliver on the climate of Sidmouth, we reprint them below without alteration.

**Sunshine at Sidmouth for the Past Year.**—"1. The total Sunshine of the year just completed amounted to 1,560 hours, or 28 hours below the average annual amount (1,688 hours) of all previous records of Sunshine Stations—namely, St. Leonards, Brighton, Eastbourne, Southbourne, Ventnor, Rousdon, and Torquay, on the South Coast, published in the Journal of the Royal Meteorological Society (see Meteorological Record 1880 to 1890).

"2. During the *warmer* portion of the year (April to September inclusive) there was a *deficiency* of 96 hours of Sunshine below the South Coast average (1,114 hours) for the same period.

*April to September (inclusive).*

South Coast Average,	1,114	hours.
Sidmouth	1,018	"
<hr/>		
Deficiency	96	"

"3. During the *colder* months (February, March, October, November, and December 1890 and January 1891) there were 68 hours of Sunshine in *excess* of the South Coast average for the same portion of the year.

*February, March, October, November, December, 1890, January, 1891.*

Sidmouth	...	...	...	542	hours.
South Coast Average (October to March).	474				
	<hr/>				
Excess	...	68			

"The prominent fact in the foregoing record is the remarkable *excess* of Sunshine over the average record of other South Coast Stations during the *cold months*, and the almost proportional deficiency during the warmer months. The excess, moreover, appears to be all the more striking because of the inclusion of one of the dullest Decembers on record; for had that month furnished the South Coast average of 56 hours—instead of only 20 hours—

the excess of winter Sunshine at Sidmouth would have been no less than 104 hours, or a surplus of more than one fifth of the total Sunshine of the South Coast (474 hours).

"There does not appear to me to be any very obvious reason why the Sunshine should have been thus distributed throughout the past year at Sidmouth. But a comparison of the published data (unfortunately too few, and only available for the past four years, see the Meteorological Record for 1886, 1887, 1888, 1889, and 1890) of Sunshine Stations on the Western half of the South Coast with those on the Eastern half would seem to support the following conclusions: that at the Devonshire stations the sun shines in excess of the South Coast average in the winter months, and proportionally below it during the autumn months (July, August, and September); while at the Eastern Stations the Sunshine during winter is slightly below the average for the South Coast, and during the autumn does not as a rule show such a reduction. I am, therefore, inclined to conclude that the distribution of *Sunshine at Sidmouth* during the period of observation has been determined by the conditions (whatever they may be) that favour in the Western portion of the South Coast *a larger proportion of Sunshine during the cold months of the year* and a proportionate reduction of it in the autumn, only it would seem the record of the past year is, in all probability, a more emphatic expression of the fact.

"A glance at the Sunshine records (published in the Meteorological Record from 1880 to 1890) of the Northern and Midland Counties—even of country places—will conclusively show the gain in Sunshine by resorting during the winter months to the South Coast, and more especially the Western portion of it. In order to clearly define this gain, I have constructed a Northern standard of comparison for the winter months, derived from all the Sunshine data hitherto published respecting the following places in the Northern and Midland districts: Apsley Guize (Bedford), Bennington (Herts), Buxton (Derby), Blackpool (Lancs), Bolton (Lancs), Driffield (Yorks), Hodsock (Notts), Marlborough (Wilts), Newton Rainey (Cumberland), Strelley (Notts), and Sutton Coldfield (Warwick). The average which these data provide does not exceed 340 hours of sunshine for the months from October to March (inclusive): while the south coast average for the same



period exceeds this amount by 134 hours, and the record under review during the past year shows that Sidmouth enjoyed 202 hours in excess of this northern average. It is easy to adduce even more forcible illustrations of the position; such as the winter average of sunshine of the city of London or of Greenwich—the former (160 hours only) being less than one third, and the latter (260 hours) only a little more than one half of the average winter record of the South Devonshire coast.

“The reduction in the proportionate amount of sunshine during the warm months (and especially July, August, and September) on the south coast of Devonshire is likewise an interesting fact; for it is more in harmony with the attested fact of the lower temperature (recorded by Dr. Radford and other observers) of the South Devon coast during the summer and autumn months than obtains inland or at Greenwich; and it, moreover, gives some colour to the general experience of delicious coolness and freshness of the atmosphere during the hottest months of the year at Sidmouth and other South Devon resorts.

“GEO. OLIVER, M.D., F.R.C.P., F.R.MET.S.”

“KNOWLE GRANGE, *February 23rd, 1891.*”

#### TAVISTOCK.

Tavistock is situated for the most part on the north-west bank of the river Tavy and is surrounded by verdant hills. The woods still extant in the neighbourhood are exceedingly luxuriant, and the rich brown soil very fertile. The town is irregularly formed, the streets are narrow and many of the houses are old. The river Tavy is particularly beautiful in this neighbourhood and runs with great rapidity over vast portions of rock forming its bed. The district is that in which the richest tin and copper mines of Devonshire are to be found; it is much intersected, too, by springs and rivulets of pure water. One of these, the Walls Brook, on the north-east of the town, furnishes an abundant and very pure water supply to the town. The drainage is fairly good.

#### TEIGNMOUTH.

Teignmouth is situated about five miles further south than Dawlish, and is at an elevation of seventy feet above the sea-level,

though most of the houses are at a still higher level: the town is built on the red sandstone and is very dry. The rainfall, humidity, and days on which rain falls seem to be lower than at Dawlish, but we have not been able to obtain reliable statistics for a number of years. High winds prevail during March, April, and May, and are usually from the east: these winds are cold but dry, and are not felt in the Coombes, where shelter can always be obtained. The sewerage has lately been completely renewed throughout the town, the pipes being supplied with automatic flushing tanks, and upright ventilating shafts after the latest improvements. The water is principally derived from an artesian well, but the supply is intermittent and somewhat limited.

#### TIVERTON.

Tiverton lies chiefly in an angle at the confluence of the rivers Exe and Loman, though it also extends on both sides of these rivers. The town is built on the slope of a hill which rises gently towards the north. Hills surround the town on all sides, but particularly on the west. The water supply is abundant and good. The drainage has lately (1890) undergone considerable alteration and improvement.

#### TORQUAY.

Torquay is situated on a bay facing due south, in Tor Bay which faces due east; above this smaller bay to the north and east, rise cliffs of 450 feet in height. Hence the town is sheltered on all sides, except that looking towards the sea, viz. the south, and even here is considerably protected: it is only necessary to go by boat outside the smaller bay to experience the degree to which Torquay is sheltered. The drainage system consists of a main high-level sewer which takes directly the sewage from nine-tenths of the population; the remaining one-tenth discharges into a short length low-level sewer. These two sewers finally discharge the whole of the sewage of the entire district at a point (Hope's Ness) three miles from the town, and in such a situation that it is delivered into the tideway of the English Channel *above* the level of high tides, and therefore cannot be forced back into the sewers, nor come near the



## THE CLIMATE OF DEVONSHIRE

TORQUAY.—Meteorological Statistics. Averages of Ten Years (1880—1889 inclusive).

Month.	Barometrer (corrected).	TEMPERATURE.			Temperature of Air, mean.	Dew-point.	Mean Humidity.	Days on which Rain fell.	Average Amount of Rainfall.	Average Cloud (0—10).	Strength of Wind (0—9).	N. Average in Days.	E. Average in Days.	S. Average in Days.	W. Average in Days.	Prevailing Wind.
		Mean of Highest.	Mean of Lowest.	Range.												
January	29.746	45.1	36.4	8.7	40.8	37.5	87.6	15.8	Inches. 2.82	7.5	1.53	6.3	7.3	7.5	9.7	W.
February	29.587	46.8	37.2	9.6	41.9	38.0	86.0	15.5	3.07	7.3	1.66	5.3	6.6	7.5	8.7	W.
March	29.617	48.3	36.9	11.4	42.3	37.3	82.2	14.8	2.96	6.6	1.61	6.7	7.9	6.6	9.8	W.
April	29.550	52.7	40.0	12.7	45.7	39.1	78.7	13.9	2.24	6.6	1.51	8.4	8.4	5.6	7.6	N. {
May	29.687	58.9	45.1	13.8	51.3	45.0	78.5	13.3	2.12	6.0	1.26	8.4	8.1	5.8	8.7	E. {
June	29.691	64.8	50.5	14.3	56.5	49.7	78.6	12.7	1.88	5.8	1.18	8.2	6.7	6.2	8.9	W.
July...	29.621	67.8	53.4	14.4	59.5	53.2	80.9	16.4	2.90	6.2	1.26	5.6	4.1	8.0	13.3	W.
August	29.666	67.6	53.3	14.3	59.9	52.8	77.5	13.2	1.96	5.9	1.18	6.6	6.1	5.9	12.4	W.
September	29.661	63.3	50.6	12.7	56.4	50.6	81.2	15.4	2.63	6.0	1.24	7.4	6.1	6.2	10.3	W.
October	29.572	55.9	44.2	11.7	49.8	44.4	83.5	18.4	4.57	6.8	1.46	8.0	6.6	6.2	10.2	W.
November	29.561	51.4	42.0	9.4	46.6	42.9	86.8	20.1	4.12	7.3	1.65	5.1	5.9	8.2	10.7	W.
December	29.661	47.4	38.0	9.4	42.7	38.7	86.6	17.6	3.41	7.1	1.50	6.0	4.3	8.1	12.6	W.
Average of Year	29.635	55.8	44.0	11.8	49.4	44.1	82.3	187.1	34.68	6.6	1.46	82.0	78.1	81.8	122.9	Total
								Total	Total			Total	Total	Total	Total	Total

shore or town again. This system is found to work perfectly and efficiently. Periodical flushing and ventilation of the sewers are amply provided for. The water supply is brought from Dartmoor, eighteen miles distant, and is delivered by gravitation to the town from two artificially constructed reservoirs 700 feet above the sea-level. The supply is constant, the water is soft, and perfectly free from organic and mineral impurities. The death-rate for residents 1881-7 was on an average under 14 per thousand. The therapeutic importance of Torquay is so great that it has been thought necessary to take exhaustive meteorological observations on the climate: an analysis of these is to be found at the end of this article, and since while considering the climate of South Devon (*supra*) we included Plymouth and Exeter, it will now be advisable to pass over in detail the climatic characteristics of Torquay by itself. Firstly, then, the average barometric pressure at Torquay is somewhat low, being only 29.635 inches, nor are there any very great differences when the months are individually examined. This lowness of barometer is accompanied by a rather high average rainfall, 34.68 inches, rain falling on 187 days in the year. The amount of cloud too (6.6) is nearly equal to that of Plymouth, an admittedly wet town. Compared with Barnstaple all these statistics show that Torquay has less sunshine. Nor is there any difference in the strength of wind between these two places. With regard to the actual prevalence of wind there is but little difference; Torquay is rather more exposed to easterly winds than Barnstaple, though considerably less so than Plymouth. At Torquay east winds are chiefly met with during the months of March, April, and May, though January is by no means free. During the last half of the year west winds are much more common than during the first half. The average temperature of Torquay is lower than that of either Exeter or Plymouth, but the difference is chiefly caused by the lower temperatures obtaining during the summer months; during the months of October to March inclusive Torquay is actually warmer, having a temperature of 44° against 43.3° obtaining at Exeter and 42.5° at Plymouth. The temperature during the corresponding period at Barnstaple is 45°. Consequently, contrary to what one would anticipate, North Devon is warmer than South Devon, even in winter, though allowance must of course be made for the fact that Torquay is on the coast, while Barnstaple



is six miles removed from it. Fogs, frosts, and snow, though occasionally met with in winter, are uncommon.

We now turn to the chief places in North Devon.

#### BARNSTAPLE.

Barnstaple is an old town built on the northern side of the river Taw, a large tidal river which empties itself into Barnstaple Bay. It is protected on its northern and eastern sides by hills which rise to from 700 to 1,000 feet a few miles from the town. The town itself faces south and west, and is thus exposed to winds from these quarters. These, as the table given at the end of this report shows, are by far the most prevalent winds, and are often boisterous and accompanied by rain. The average temperature is  $51.1^{\circ}$ , and the degree of humidity  $82.1^{\circ}$ . North-east and east winds prevail most during the months of March, April, May, and November, and in the spring months are accompanied by comparatively little rain and cloud. The actual strength of wind also during the spring months is below the average. The system of drainage is the water-carriage system, the sewage being conveyed into impounding tanks, and thence into the River Taw; from this cause the lower parts of the town are subject at high tide to occasional floodings. The water supply is obtained from a stream called the Yeo; it is abundant in quantity and of fairly good quality, though somewhat hard, and has a heavy vegetable contamination; however, in 1890, new filter beds and a new reservoir were constructed, so that the contamination in all probability has since greatly diminished: at the same time arrangements were made for efficient flushing of the sewers, which previous to that date had not obtained. The chief causes of mortality are those of the respiratory organs (including phthisis) and chronic renal disease with its complications. Nearly 40 per cent. of all deaths occur in persons over sixty years of age.

#### BIDEFORD.

Bideford, nine miles south-west of Barnstaple, is a seaport town that was formerly of considerable importance. The editors of the *Magna Britannia*, writing in 1737, represent it as "now one of

# METEOROLOGY OF BARNSTAPLE

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BARNSTAPLE. — Meteorological Statistics. Averages of Fifteen Years (1858-1872).

Month.	Barometer (corrected.)	Thermometer.			Dew-point.	Mean Humidity †	Days on which Rain fell.	Average Amount of Rainfall.	Average Cloud. (0-10).	Strength of Wind.*	N	N.E.	N.W.	E.	S.	S.E.	S.W.	Average in Days.	Average in Days.	Prevailing Wind.
		Mean of Highest.	Mean of Lowest.	Range.				Inches.			Average in Days.	Average in Days.	Average in Days.	Average in Days.	Average in Days.	Average in Days.	Average in Days.	Average in Days.	Average in Days.	
Jan.	29.839	46.3	36.6	9.6	41.6	38.0	86.2	19.0	4.55	1.65	2.0	3.0	3.6	2.6	4.0	5.1	6.6	3.9	6.6	S.W.
Feb.	29.928	48.5	38.2	10.2	43.7	40.0	86.8	16.8	4.89	1.38	1.9	2.6	3.3	2.4	4.3	3.7	5.3	4.0	5.3	S.W.
Mar.	29.828	50.6	38.8	11.8	44.2	39.9	85.3	16.5	2.79	4.20	1.51	3.3	3.9	6.4	2.3	2.8	4.6	4.5	4.6	N.W.
April	29.948	58.1	42.4	15.7	49.5	44.1	81.2	13.1	2.38	1.25	1.5	3.1	4.1	3.4	2.2	4.3	6.2	5.2	6.2	S.W.
May.	29.936	63.1	46.1	17.0	53.9	45.5	76.1	11.1	2.32	3.29	1.26	0.5	4.8	4.0	3.3	4.6	5.6	5.3	5.6	S.W.
June	29.967	67.6	51.9	15.7	58.3	53.5	80.5	12.8	2.73	4.17	1.34	1.5	2.3	5.5	3.5	4.2	5.9	6.1	5.9	W.
July	29.958	71.1	54.2	16.8	62.1	54.5	77.0	12.9	3.01	3.48	1.24	1.3	2.0	4.4	4.6	3.3	6.7	6.7	6.7	(S.W.)
Aug.	29.930	69.9	54.2	15.7	61.1	53.5	76.6	14.4	3.43	3.82	1.52	0.9	1.6	5.0	4.9	4.3	6.3	6.1	6.3	S.W.
Sept.	29.890	65.2	51.2	14.3	57.9	52.9	82.5	18.1	4.11	4.07	1.54	1.1	1.9	2.5	3.1	4.5	4.3	4.9	4.9	S.W.
Oct.	29.830	59.3	47.1	12.2	52.2	47.7	83.1	20.9	4.98	4.38	1.56	1.7	1.9	4.5	3.9	5.3	5.7	4.1	5.7	S.W.
Nov.	29.866	51.4	40.5	10.8	45.2	40.8	82.8	17.6	3.96	3.89	1.54	3.5	3.9	3.5	2.5	2.7	4.2	4.1	4.2	S.W.
Dec.	29.867	47.6	37.9	9.6	43.1	39.7	87.8	19.1	3.89	4.42	1.56	2.1	2.3	4.8	3.5	4.7	6.3	3.9	6.3	S.W.
Average of Year.	29.899	58.2	44.9	13.3	51.1	45.8	82.1	192.3	40.38	4.07	1.45	21.3	33.4	51.7	31.9	43.7	50.8	72.4	58.8	Total

\* Average for years 1858-63 only—after then observations wanting. Force estimated from 0-6.

† Saturation=100



of various kinds form a large proportion of those to which the inhabitants of Devonshire are liable, and in particular contribute a large number towards making up the mortality returns, it is very difficult to decide to what extent the actual climate is responsible for this, and to what extent it merely depends upon the fact that a very large proportion of the inhabitants are hereditarily or otherwise subject to diseases of this type and have been drawn from other parts of the British Isles.

The diseases most prevalent in Devonshire—as in the Channel Islands—are mainly of the chronic type, such as chronic rheumatism, chronic Bright's disease, chronic forms of phthisis, chronic bronchitis, neuralgiæ of long standing, and anæmia.

Anæmia is common, and is very often accompanied by, or subsequent to, profuse menstruation. As elsewhere, it is chiefly met with in young women of the servant or shop-girl class, is very often extreme and intractable, and is not, in the case of Barnstaple, diminished by the fact that the ordinary drinking-water is largely impregnated with iron. In fact, such is its prevalence in that town that Dr. Mark Jackson, the medical officer of health, considers himself justified in wondering whether the iron of the water may not be responsible for anæmia being so frequently met with. The inhabitants of Dartmouth, Sidmouth, and Dawlish, however, do not seem to be affected to the same extent as other places in Devonshire. Associated gastric ulcer is also of frequent occurrence.

*Scrofulous and Tubercular Affections.*—If we except strumous ophthalmia, which is fairly common, scrofulous and tubercular diseases are somewhat rare, particularly in the form of joint disease: nevertheless, North Devon furnishes more cases of joint disease than South Devon. In both districts however, glandular affections are far more commonly met with.

*Phthisis.*—Amongst lung diseases phthisis naturally claims the most attention. As a rule the phthisis is of a chronic kind and copious hæmoptysis is rare, while fatal hæmoptysis is excessively rare. This would lead to the assumption (with a fair degree of probability) that the disease rarely goes on to the vomica stage, but stops short and produces a general fibroid thickening of the apices. Profuse hæmoptysis, fatal or not, is so commonly associated with the formation of vomicæ and the aneurismal dilatation

of unsupported blood-vessels in their walls, that this general rarity of hæmoptysis, noted throughout the county, would render the view expressed above at all events probable, while it would also explain in some measure the fact that in a somewhat large number of cases phthisis is certified as the cause of death in persons over the age of thirty-five years. Thus in Exeter nine out of forty-nine deaths reported to us as occurring between the ages thirty-five to sixty-five, are certified as being due to phthisis. Among younger adults that form of phthisis least frequently associated with hæmoptysis is the "pneumonic," and in Barnstaple this pneumonic phthisis is said to be the prevailing type of the disease. As a rule pneumonic phthisis runs an acute course and attacks persons about the age of twenty-five years. From the same source, at Exeter we find that thirteen out of twenty deaths (occurring in the practice of a medical man of much experience) between the ages of fifteen and thirty-five were due to phthisis; only one of these is noted as having been accompanied with "severe hæmoptysis." Phthisis also is chiefly found among the poorer population; at Sidmouth, for example, Dr. Williams writes, "it is chiefly found in persons of the fisherman class."

*Bronchitis and Asthma.*—Bronchitis is common, and, as usual, at the two extremes of life. Asthma, uncomplicated with renal or cardiac disease, is somewhat frequently met with. Acute pneumonia is fairly common, and with acute rheumatism forms the principal acute disease to which residents are liable. It does not show any great difference in its distribution, but as a whole is less met with on the south-east coast than elsewhere. Pleurisy bears on the whole a very close relationship to the prevalence of phthisis, except at Teignmouth, where it is said to be of infrequent occurrence; it is impossible to say what proportion the cases of tubercular bear to those of non-tubercular origin.

*Renal disease* of the chronic albuminuric form (presumably granular kidney) is common, but not so common as phthisis. It seems to be less prevalent in Teignmouth, Newton Abbot, and Dawlish than elsewhere. It may be noted, however, that apoplexy is not an unfrequent cause of death in aged persons, which may lead to the suspicion that the prevalence of chronic renal disease has been understated. Acute renal disease is rare, and appears generally as a sequela of scarlatina. As the result of exposure it



is not often seen. Calculus, vesical or renal, and gravel are scarcely ever met with.

*Acute rheumatism, per se*, and exemplified by the number of cases of cardiac disease occurring, is somewhat more prevalent than elsewhere in the kingdom; nevertheless at Torquay it appears to be of decidedly rare occurrence. In the chronic form it is very frequently met with and without distinction throughout the county. Chronic rheumatic arthritis is rarer, but still more prevalent than elsewhere in England.

*Neuralgiæ* of all kinds are very common indeed, and with chronic rheumatism and catarrh form the chief maladies, not dangerous to life, to which the inhabitants of Devonshire are exposed.

*Skin diseases* are rare, except eczema, herpes zoster, and psoriasis. The first of these is chiefly met with in the case of scrofulous and ill-fed children.

*Malaria* is entirely absent from Devonshire, except in Plymouth, where it is, as a rule, imported; but in Newton Abbot, for example, and other similarly low-lying places it was formerly prevalent to a greater or lesser degree, and even now, persons who have contracted ague elsewhere, if they take up their residence in such situations, are very liable to experience a return of their symptoms.

*Enteric fever* is seen sporadically, or in small epidemics throughout the county, but is not of frequent occurrence. The low-lying parts of Newton Abbot, however, are more frequently attacked, and owing to the deficient drainage and the use of surface water, or water from shallow wells in most of the small villages, when once a case has been imported the epidemic is liable to be severe and widespread. Diarrhoea amongst adults is not a common condition—amongst infants it is frequently seen as the result of bad feeding. Nevertheless, it is undoubtedly more frequent as an epidemic than typhoid.

*Scarlatina* occurs in mild epidemics, and especially in those towns near large centres of population. Thus, Tavistock is regularly visited by an epidemic imported from Plymouth. As a rule it is of a very mild type.

*Diphtheria*, though less frequent than scarlatina, is, like it, most frequently imported. Concerning epidemic sore throat we are unable to give any reliable information. The reports are very

conflicting, and practitioners seem at a loss as to what condition of throat should be placed under this heading. Dr. Williams, of Sidmouth, says, "Epidemic sore throat is fairly prevalent amongst the poor who inhabit insanitary dwellings; it does not occur amongst the well-to-do, nor does it attack visitors." Dr. Jackson, of Barnstaple, says, "Follicular tonsillitis and quinsy are of very frequent occurrence." Most of the other medical men with whom we have been in communication make no remark of any sort.

A few words may now be said concerning the prevalence of disease on the moors. For this we are indebted to the kindness of Dr. Stone, of Dartmoor Convict Prison. We have been unable to get any information whatever concerning Exmoor. Dr. Stone is therefore the authority for the subjoined statements. Anæmia of an extreme degree (dependent, it is supposed, upon the dampness and the almost complete absence of sunshine) affects about 70 per cent. of girls between the ages of fourteen and twenty-three years. Scrofula is very common among the "moor aboriginal" population, especially in children. The supposed causes for this are the degree to which intermarriage is carried, the deficient ventilation and feeding, and the very low level of morality present. Warders' families are but rarely affected. Phthisis seldom originates on Dartmoor, but if it does so it is generally associated with profuse hæmoptysis. Cases sent from Plymouth or elsewhere benefit if the weather is fine and dry, *i.e.*, especially in July and August, but do badly at other times. Bronchitis is very common in spring and winter, as are catarrh and chronic muscular rheumatism. Dry pleurisy is very common, but with active effusion is rare; acute pneumonia is fairly common, and is generally met with in winter. Asthma is also rather common. All kinds of renal disease are very rare, including chronic granular kidney. Neuralgiæ are especially common and very intractable. Follicular tonsillitis causes 40 per cent. of all the diseases amongst children, in whom it is chiefly seen. Other diseases call for no special comment.

Old age is so common in Devonshire that more than one-third of the annual deaths occur in persons over the age of sixty, while in many of the quieter towns, country villages, and particularly on the high land this proportion would very nearly hold good for the age of seventy. In spite of the trials to health the denizens of



Dartmoor have to pass through, especially during their younger years, Dr. Stone writes, "Most of the permanent residents are hearty at seventy."

The chief causes of mortality amongst adults are lung diseases, especially phthisis and bronchitis; chronic renal disease, either by itself or by some of its complications—particularly the cerebral; and morbus cordis. Heart-disease being so commonly a sequel of acute and so rarely a sequel of chronic rheumatism, and being of such importance in the death returns, suggests that the prevalence of acute rheumatism, as already mentioned, may be under-estimated, perhaps on account of its not infrequently attacking children without giving rise to any but the most trivial symptoms.

It is noteworthy that in North Devon generally an enlargement of the thyroid, both of a purely goitrous nature and as part of the series of phenomena constituting exophthalmic goitre, is of frequent occurrence. Dr. Jackson, of Barnstaple, remarks, "I have lived and practised in Derbyshire, but was never so impressed with the number of cases of goitre as since my residence in this district." For this the generally humid character of the climate is probably accountable. As the water is derived almost entirely from the elevated portions of the county, which consists almost absolutely of granite, the supposed influence of chalk in the water is completely eliminated.

**Therapeutic Uses of Climate.**—The therapeutic uses of the climate of Devonshire may be considered in reference to three classes of diseases—(1) respiratory—particularly phthisis; (2) renal; and (3) rheumatic with allied and subsequent conditions.

(1) **Pulmonary**—(a) **Phthisis.**—With regard to phthisis pulmonalis, the advantages are that the air is moist and unirritating; that as a rule the breezes are light and from the west, that the prevalence of cloud is small, and hence that there is a large average amount of sunshine; that the daily as well as the monthly and yearly range of temperature is comparatively small; and that while the winter months are warmer the summer months are cooler than the average of the rest of the kingdom.

The disadvantages are the moistness of the air, the physical character of the ground, and the prevalence of easterly winds in spring.

Most of the points mentioned above sufficiently indicate the

direction in which they militate for or against the consumptive patient; but one or two—and particularly the disadvantages—call for a little more remark. The importance of the small average daily range of temperature is to be seen in the fact that the nights are not extremely cold, and as a corollary that Devonshire is particularly favourable for good ventilation of the bedroom during the night. So large a proportion of the twenty-four hours—particularly in the case of an invalid—is passed in the bedroom that the value of this climatic condition cannot be easily overstated.

The summer temperature is lower than that of Greenwich and the kingdom generally. In a paper by one of us (W. S. L.-B.) in the *Lancet* of 1891, vol. ii., statistics are given which tend to show that the lower the summer temperature, the more favourable, especially as regards bodily temperature, is the condition of phthisical patients. If this be so, the lower summer temperature of Devonshire should be of advantage in phthisis, and there is no doubt that, in the early stages of consumption at all events, a residence in Devonshire tends to the production of a fibroid induration, a diminished tendency to excavation, and generally to a quiescent condition of the disease.

The disadvantage of the moistness of the air may perhaps be accountable for the prevalence in North Devon of the "pneumonic" form of phthisis. In the same way as spraying liquid charged with tuberculous matter into the lungs of guinea-pigs produces first a broncho-pneumonia, upon which true tuberculosis is subsequently engrafted, so it is possible that the excess of minute particles of water normally present to a marked degree in Devonshire air may lead to a like tendency of the phthisis to assume a broncho-pneumonic or pneumonic shape. In any case, the larger bronchi primarily, and secondarily the rest of the lung, must be in a more moist condition than where the humidity of the air is less, and hence supply a more favourable nidus where the tubercle bacillus can settle and multiply.

The life history of the parasites of plants (which is better understood than that of the parasitic diseases of man) affords illustration of this view, and has a direct bearing on the accessibility of the body to the action of micro-organisms in consequence of modification of the environments. A parasite whose natural function it is to flourish only in the presence of decay and death



may gain access to the tissues of living terrestrial plants, if these plants are by chance aquatic in their habits and water-logged in texture.

It is probably not so much that the plants by living in water have become actually diseased, as that their juices are diluted, and therefore their resistance to the parasite is diminished.

The prevalence of east winds in spring is a disadvantage, particularly in this way: Many cases of phthisis, as is well known, having passed fairly well through the winter, take on active disease in the spring, and this tendency is increased by the fact that persons with an injured lung are liable, on exposure to easterly winds, to have a bronchial attack—*per se* a much more serious condition—instead of a mere catarrh, which the same winds are so likely to produce in healthy persons. Hence *ceteris paribus*, easterly winds are far more fraught with danger to persons with pulmonary complaints than to any other class of invalids. Nevertheless, this danger from east winds, though it is still a real one, is less in Devonshire than elsewhere in the kingdom. With regard to chronic bronchitis, the climate is at least equally favourable. Persons who have been accustomed to spend the whole winter indoors, and in whom the usual "winter-cough" has lasted hitherto for months, on taking up their residence in Devonshire, find that they can spend the greater part of the day out of doors, and that the duration of their attacks is reckoned by weeks instead of by months. That form of asthma associated with a neurotic temperament does not appear to be much benefited, but the bronchial and cardiac varieties are often relieved, and particularly by residence in Sidmouth, Teignmouth, and their neighbouring districts. The uncertainty, however, of the climatic conditions to which various cases of asthma will yield, suggests that in some parts of Devonshire districts could be found by personal experience where the liability to attacks would be lessened.

With regard to recurring catarrh of an irritative type, the climate of Devonshire, and of South Devon in particular, is markedly serviceable, and is peculiarly suited to children having this tendency. On the other hand, it is not a climate favourable for healthy children, as they are apt to grow up unduly susceptible to the effects of sudden changes of weather such as are common elsewhere.

(2) **Renal Disease.**—Renal disease. Corresponding with the fact that renal disease is most prevalent in the temperate zones and especially common in England, no part of England is very suitable for the treatment of such cases. The general moisture of the air, the sudden changes, and the great range of temperature are not favourable to the subjects of renal disease. Nevertheless there are some parts of England more favourable than others, and of these the south-east coast of Devon is perhaps the most so. Exeter, Sidmouth, and the more dry, elevated and sunshiny resorts in the neighbourhood where the westerly breezes are less humid, and where the action of the skin—of paramount importance in renal cases—is less impeded, are perhaps the least injurious spots in England.

(3) **Rheumatism—Other Disorders—Cardiac Diseases.**—Cases of rheumatism ought not to be sent to Devonshire, for the climatic influence is decidedly injurious, though some districts, *e.g.*, the moors and Plymouth, are more injurious than others. Neuralgiæ also do not seem to derive any benefit, nor do many cases of anæmia except those accompanied by obstinate constipation, which recover almost anywhere if the constipation be overcome. The unirritating condition of the air is favourable for cases of skin disease, especially eczema, provided the patient be not too near the coast, where the salt-laden breezes are apt to be injurious. Cases of cardiac disease ought only to be sent to Devonshire after great consideration, firstly, because of their frequent rheumatic origin; secondly, because of the relaxing nature of the air, which leads to the accumulation of fat and hence to a throwing of more labour on the already injured heart; and, thirdly, because of the hilly nature of the ground. This last condition is often the cause of fatal syncopal attacks, and such sudden deaths are not infrequent in Devonshire. The climate is not sufficiently bracing for scrofulous children, and in spite of the small amount of scrofulous disease seen in Devonshire there is no evidence that the benefit such patients gain is at all marked.

**Old and Debilitated Persons—Convalescents.**—The climate is especially favourable to old and debilitated persons and those who are commencing convalescence after an acute or long-continued



illness—with the principal exception of acute rheumatism—*i.e.*, persons whose enfeebled powers do not allow them to maintain a sufficient bodily warmth by physical exercise during the winter months. During the summer months it is favourable to cases of phthisis and to such persons whose habit of body renders extreme warmth uncomfortable or intolerable, and who nevertheless cannot afford, pecuniarily or by reason of their health, a journey to the north of Scotland or any other similar place.

**Choice of North or South Devon.**—Lastly, assuming Devonshire to be selected, the question remains for consideration whether North or South Devon should be chosen. The moors may almost be left out of consideration, for though the climate is certainly bracing, it is bracing to an extent that few invalids could bear (though for strong and healthy persons it is often most valuable), while the number of days on which rain falls even during July and August, the finest portion of the year, is so great that the patient would probably spend the greater part of his sojourn indoors. The choice therefore lies between North and South Devon, and must be influenced by the idiosyncrasies of the patient. It is largely a question of the heat bearable, and the power to resist winds. From the less prevalence of east winds as well as the higher temperature, in most cases North Devon would seem to be more suitable during spring and winter, though no doubt such sheltered places as Torquay and Sidmouth are most favourably situated. Moreover, there is throughout Devonshire so much shelter obtainable that the question of wind may to some extent be neglected. During the warmer weather an invalid might with advantage commence his stay in South Devon, and after a while migrate to more invigorating North Devon resorts, or even to Exeter, while if circumstances permitted, he might later change his residence to one of the more bracing counties of England. The question also has to be considered to what extent quiet or more or less excitement is needed. During the winter for example in South Devon the visitors are more numerous than they are in North Devon, while the nearness of the towns in South Devon would provide change of scene more rapidly and with less trouble to the patient than in the north. These and similar minor characteristics are collectively of

importance in aiding or marring the influence for good the climate itself might produce on the patient we have decided to send there.

**Note.**—In addition to the gentlemen mentioned in the text, we have to acknowledge our indebtedness to Drs. Gordon of Exeter, Karkeek of Torquay, Eccles and Merrifield of Plymouth, Williams of Sidmouth, Gardner of Ilfracombe, and many others, from whom we have received much valuable information.



## THE CLIMATE OF THE CHANNEL ISLANDS

By E. SYMES THOMPSON, M.D., F.R.C.P.,

AND

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### DEFINITION OF DISTRICT.

The Channel Islands, comprising Jersey, Guernsey, Alderney, Serk, Herm, and several smaller rocky islets, are situated in the bay of St. Michael off the coast of Normandy, and lie between the latitudes of  $49^{\circ}10'$  and  $49^{\circ}42'$  N., and  $2^{\circ}2'$  and  $2^{\circ}40'$  W. longitude. Of these islands Alderney is the most northerly, Guernsey the most westerly, and Jersey the most southerly, while for our purpose the two latter are those which alone merit consideration. The total area of the islands is about 73 square miles, and the population 88,000.

### JERSEY.

Jersey, roughly quadrilateral in shape, is ten miles in length and five miles in breadth, and slopes from north to south, the whole of the northern coast with the eastern and western shoulders being composed of precipitous cliffs, the majority of which are 100 feet in height, while some few reach more than double that height. The southern coast, on the contrary, though fringed with crags, lies low and has a considerable portion of sandy beach. The whole circumference is indented with bays, coves and inlets, the principal being those of St. Aubyn on the south, and St. Ouen on the west.

## GUERNSEY.

Guernsey is triangular in form, and has a circumference of thirty miles, its length from north-east to south-west being twelve miles, its breadth from north to south nine miles. The island, contrary to what obtains in the case of Jersey, has its vale side on the north, where it is low and flat, while the land rises gradually to the south, where the coast is intersected by deep ravines, and the cliffs rise precipitately to a height of 270 feet above the sea level.

**Physical Characters.**—As far as physical characters are concerned, Jersey presents the appearance of a well-wooded country, chestnuts, elms, and oaks being especially abundant, while Guernsey is devoid of anything that could be called a wood, and coppices are equally rare.

**Geological Formation.**—The geological formation of both islands is mainly granite, the cliffs of the northern coast of Jersey being sienitic granite, while the southern lowland consists of schist superincumbent on the granite. Limestone, chalk, marl and gravel are only found to a trifling extent. The soils are those arising from the disintegration of the granite and schist, and in the main are rich and fertile, though waste-land covered with furze is found to a considerable extent in the western and northern quarters of Guernsey. Nevertheless two-thirds of this island are under cultivation.

**Winds.**—Owing to their position the islands are greatly exposed to the winds from all directions, but the natural formation of Jersey protects it largely from northerly winds, while that of Guernsey leaves it exposed to them. Sharp easterly and north-easterly winds are prevalent in both islands during the months of March and April. As is easily understood, the winds are, generally, moist and heavily salt-laden.

**Configuration of Surface.—Elevation.**—Both Jersey and Guernsey are well situated as regards natural drainage, not only on account of the sloping nature of their soils, but also because they are largely intersected by deep ravines. These, in Jersey particularly, intersect the island from north to south, and in the south spread out into excellent pasturage flats.



**Vegetation.**—As said above, the natural vegetation of Jersey is more luxuriant than that of Guernsey; nevertheless, in both islands large tracts are under cultivation. Apple-trees, in particular, grow well, and with wheat form the staple sources of wealth to the inhabitants. Fig-trees, sweet and Seville oranges, myrtles, all flourish in the open air, the myrtles often rising to 20 feet in height, while fuchsias of 8 feet in height are common. Magnolias, oleanders, and Guernsey lilies blossom in profusion.

**Ocean Currents.**—The effects of ocean currents upon the climate of the islands are difficult to gauge. The numerous submerged rocks, and small islands cause many swift currents, but the tides around Jersey do not appear to be influenced by others in the Channel, for they flow E.S.E. towards St. Michael's Bay—thence they continue along the Norman coast, and in the course of twelve hours encircle the islands, returning after a circuit of 12—15 miles to the spot whence they began to flow. This fact suggests that other ocean currents may have but little effect upon the climate; of course, with all Western Europe, the climate of the Channel Islands is modified by the flow of the Gulf Stream.

**Climate, &c.**—The general climate of Jersey and Guernsey is mild, moist, and relaxing, though frequently in spring there is a stretch of bracing weather with the crisp easterly and north-easterly winds above spoken of. It is intelligible from the configuration that these winds should be especially felt on the higher land, and hence on the north side of Jersey, while Guernsey being unprotected on the north would feel the full force of them in its whole extent, offering no sheltered part, as is done by the southern low-lying coast of Jersey.<sup>1</sup> Hence we are prepared to find that in spring and early summer the temperature in Guernsey is lower than that of the southern coast of Jersey, the difference being one of nearly 2°.

To a certain extent the higher average temperature of Jersey obtains throughout the year, nevertheless between the average temperatures of the two islands during the period December—February, inclusive, there is a difference of 1° in favour of Guernsey.

<sup>1</sup> N.E. winds are more prevalent in Guernsey, and, according to Hoskins' tables (*Proc. Roy. Soc.* 1867), are frequent in March, April, May, and September. During the two latter months Jersey is nearly exempt.

The comparative temperatures of the two islands and that of the general temperature of the British Isles is as in the table given below :—

	Spring.		Summer.		Autumn.		Winter.
Jersey ..	48°·7	...	60°	...	53°	...	43°
Guernsey ...	47°	...	59°	...	53°	...	44°
British Isles ...	47°	...	60°·9	...	50°	...	38°·43

The differential advantage of the two islands is thus shown to be very slight either one way or the other, whereas in autumn and winter—*i.e.*, between the months of September and February, both inclusive, there is a very considerable advantage in both over the rest of the kingdom as a whole. This advantage in temperature is, however, to a certain extent counterbalanced by the fact that the above period is the wettest during the year.

**Rainfall.**—From statistics extending over a period of ten years (1865—1874), and taken at a sheltered spot on the south coast of Jersey, it appears that between September and February, both inclusive, rain fell on 105 days, and the total rainfall was 20·71 inches, while from March to August, both months inclusive, rain fell on only seventy-one days, and the total rainfall was 12·87 inches. October appears to be the wettest month, but is very closely followed by January; these two months accounting for nearly one-fourth of the total rainfall during the year. In spite, however, of this fact, there is a very large amount of bright sunshine, so much that the period of autumn is called by the peasantry, “le petit été de Saint-Martin.” The most trying time of the year is undoubtedly March and April, owing to the north-easterly winds, and, as will be seen later, bronchitis and other pulmonary diseases are then most common.

**Barometer.**—Barometric pressures are also lowest during October and January, being 29·92 in. and 29·82 in. respectively, and highest from April to September, when they average 30·00 in. It is worthy of note that the same pressure (30·00 in.) is found in February, but, as is well-known, easterly and north-easterly winds are foretold by a high barometer.

**Winds.**—Except during the months of March, April, and May, the prevailing winds are westerly and south-westerly, especially the latter. The gales of Jersey are usually from the south-west, as is shown by the growth of the trees in the more exposed parts of the island. From data given in Hoskins’ Tables, it is found that,



from the years 1843—1862, inclusive, the average prevalence of winds in Guernsey during the year was

N.E. wind prevailed on 100 days.	N.W. wind on 110 days.
S.W. „ „ 104 „	S.E. „ „ 51 „

Nevertheless all the winds from the south are mild, and not unpleasant, though the south-west wind is mostly accompanied by rain. Although humid, the islands are less so than Cornwall or Devonshire, but the winds are stronger than in South Devon. Catarrhal and pneumonic affections are alike common in both places, and are largely due to the same cause—viz, an unreadiness to adopt precautions on the rare days when they are needed.

**Sunshine.**—This is the strong point of the climate of the Channel Islands. Recent statistics show that Jersey receives more sunshine than any other part of the United Kingdom. This is clearly brought out by the subjoined table, compiled from observations taken at Fort Regent, Jersey, for the Meteorological Office.

Year.	Hours of Sunshine.	Excess over highest record in the United Kingdom.
1887	1,829	298
1888	1,710	251
1889	1,721	243
1890	1,842	274

The following table shows the same fact in more detail.

BRIGHT SUNSHINE AS RECORDED IN HOURS FROM 1ST NOVEMBER, 1888, TO 31ST OCTOBER, 1889, AT JERSEY, HASTINGS, AND GLENCARRON.

	1888.		1889										Aggregate.
	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June.	July.	Aug.	Sep.	Oct.	
Jersey . .	50.5	75.2	73.5	66.2	145.9	161.2	195.7	219.5	233.4	210.5	196.1	113.7	1741.4
Hastings <sup>1</sup>	36.0	82.5	50.3	65.8	99.4	132.4	200.3	265.0	198.4	209.7	171.9	104.2	1615.9
Glencarron <sup>2</sup>	36.2	4.5	11.7	26.0	78.7	81.0	103.0	158.4	104.2	23.6	49.9	66.2	748.4

**Resorts.**—The limited areas of Jersey and Guernsey necessarily do not allow of much variation of climate in different districts: it is sufficient to state that St. Heliers is situated on the south coast of Jersey, while St. Peter's Port, the only town in Guernsey, is situated on the side of a hill on the east coast. The preceding climatic details are sufficiently copious to judge

<sup>1</sup> Station showing the highest aggregate next to Jersey over the British Islands during the period.

<sup>2</sup> Station showing the lowest aggregate in the British Islands during the period.

of the particular characteristics of these, the two chief resorts in the Channel Islands.

**Drainage and Water Supply (Jersey).—**The drainage of St. Heliers is emptied into the sea, the outfall sewers being carried out some distance and provided with tidal valves. Cesspools are sometimes found in the suburbs of the town, and their use is general throughout the rest of the island. Attention is now being paid to the cutting off of houses from the main-drains and cesspools by means of ventilating traps, and the proper ventilation of soil-pipes is being gradually adopted.

The town and suburbs, as well as some parts of the country, are supplied partly with well and partly with surface-water, by means of water-works. Private wells are also used, and in the country the supply is obtained from this source and from stored rain-water.

**Drainage and Water Supply (Guernsey).—**The water supply of Guernsey is derived from public and private wells, a few of them being deep, *i.e.* over 50 feet, but the majority shallow. The water is much contaminated with vegetable impurities, with chlorides, and contains much magnesia, though the ammonia-impurities are small. A proposal is on foot to supply St. Peter's Port with water from artesian wells. There is drainage by good main sewers, which however are ventilated at the street level; in most cases there is no proper disconnection between house pipes and the main sewers, and only in a few instances are house drains ventilated. In some parts of the town, also, cesspools are the only means of drainage existent, while in the country around this method of disposal of the sewage is the rule.

**Prevalence of Diseases.**—Dividing diseases into two classes, acute and chronic, it is remarkable that the Channel Islands are very free from the acute class. Even those diseases (*e.g.* rheumatism) which show themselves under both forms maintain the same distinction in prevalence. To this rule there is only one exception of importance—pneumonia, which in the acute form is fairly common; acute follicular tonsillitis, also, is by no means rare in spring. Bearing in mind the frequent association of the latter condition with acute rheumatism, it is remarkable that this latter is quite the exception. Chronic phthisis and bronchitis, chronic Bright's disease, chronic rheumatism, rheumatoid arthritis, neuralgiæ and gout are the diseases most usually met with. Scrofulous or tuberculous affec-



tions are decidedly rare except in the form of scrofulous glands in children. Eczema—unassociated with gout, or in children as the result of bad hygienic conditions—is rare. Scarlatina appears now and again in the form of a very mild epidemic, acute pneumonia, and pleurisy are fairly often met with, while true diphtheria, calculus (vesical), typhoid fever, asthma and malaria are almost unknown. Nephrolithiasis and gravel are less uncommon than vesical stone, but are still rare, and malaria is never seen except in those who have contracted it elsewhere. All diarrhœic affections are uncommon except in infants, during summer, as the result of improper feeding.

**Phthisis.—Intermarriage.**—Phthisis, as above said, is mainly seen in chronic form, rarely attacks individuals under the age of thirty, is not commonly associated with hæmoptysis except in the cavity stage, though it is not unknown as one of the earliest symptoms, when however it is never so profuse as to become dangerous. Phthisis does not seem to be affected by the very general custom of intermarriage. Owing to the existence of the law of gavel-kind, this intermarriage is particularly common amongst the natives, but, nevertheless, it is rare for two members of a family to succumb to phthisis, while instances of whole families being swept away by the disease are remarkable by their very infrequency. In the parish of St. Heliers during the years 1889 and 1890, 10·8 per cent. of the deaths were attributable to this disease.

**Anæmia and Neuralgiæ.**—Anæmia is not uncommon, but is of that usual type seen in young women, particularly of the lower classes, who work under insanitary conditions. In the upper classes it is associated with profuse menstruation, and is especially seen in the floating population of visitors. Neuralgiæ of all sorts, but particularly facial neuralgia, are very common, and are generally accompanied by or dependent upon anæmia. The climate has a distinctly bad effect on these neuralgic affections.

**Old Age.—Chief Causes of Death.**—Old age together with a considerable maintenance of bodily and mental faculties is quite the rule, persons of eighty years of age being common, and of ninety years and upwards by no means rare. A chance visit at the St. Peter's Port Hospital containing seventy beds, gave thirty-eight persons age seventy to eighty, sixteen persons eighty to ninety, and four persons ninety to ninety-nine. In fact "old age" with chronic diseases of the respiratory organs,

particularly chronic bronchitis, and cerebral results of chronic renal affections, include by far the largest number of deaths; nevertheless, as there are no really reliable registers of deaths in the islands, the actual numbers cannot be given.

**Therapeutic Effects of Climate and Indications for Use.**—The mild and sunshiny nature of the climate of the Channel Islands is therefore that point upon which all their other qualities turn, and in particular the considerable advantage they possess in late autumn and winter. Old and worn-out persons, especially those with bronchial affections, are most likely to derive benefit, while the east and north-east winds in March and April, and the prevalence of respiratory troubles during those months, are an indication that persons with such diseases should not prolong their stay after the end of February. The moist nature of the air is a distinct contra-indication in all rheumatic affections and neuralgiæ, while the heavily salt-laden condition of the air throughout the year is equally injurious to all forms of eczema. This same moisture is unfavourable to the subjects of renal disease, and quite counterbalances the advantage they would otherwise derive from the greater warmth. All strumous diseases and habits of body are in the same category, and consequently should avail themselves of the late spring and summer months, when the comparative absence of moisture and the sea-breezes are in their favour. The value of the Channel Islands for delicate strumous or rickety children is immense. The large belly disappears, the stick-like legs fill out, the big joints and bending bones cease to be noticed, and signs of rude health are in a few months seen. It is impossible to be in these islands without noticing the breadth and full development of the children.

There are many cases in which the voyage to Madeira or the Canaries seems too great or costly an undertaking, in which the short trip to the "Norman Archipelago" will suffice; nevertheless, it must be remembered that the passage to the Channel Islands is often very rough, and hence inadvisable for old and debilitated persons, while the straining of sea-sickness during the voyage has in our own knowledge been the exciting cause of cerebral apoplexy in subjects of chronic granular kidney. The fact remains, however, that within seven or eight hours of London a winter haven is to be reached where camellias and rhododendrons flower in the open in February, where frost is rare, and lasting snow unknown.



*Note.*—The following gentlemen have supplied us with much valuable information :—Dr. Dunlop of Jersey, Dr. Aikman of Guernsey, and Messrs. Dobie, Le Paye, Robinson, and Surgeon-Major Ryan. The above conclusions are largely based upon the reports thus furnished.

## MONTHLY MEANS FOR TEN YEARS 1881-90.

Station, GUERNSEY, CHANNEL ISLANDS. Height above Mean Sea Level, 180 feet.

F. E. CAREY, M.D., F.R.Met.Soc., Observer.

MONTH.	TEMPERATURE OF AIR IN MONTH.			Mean Temperature of Air in Month.	Mean Relative Humidity (9 a.m.).	Amount of Sunshine.	Mean Cloud (9 a.m.).	RAIN.	
	Mean of Highest.	Mean of Lowest.	Mean Daily Range.					Days it fell.	Inches.
	°	°	°	°	%	<sup>1</sup> hrs.			
January ...	47·0	39·7	7·3	43·4	89	68	7·3	17	2·99
February ...	46·6	39·9	6·7	43·2	88	87	7·3	16	2·50
March ...	48·9	40·1	8·8	44·5	84	149	6·6	14	2·04
April ...	52·8	43·2	9·6	48·0	82	188	6·3	13	1·96
May ...	59·1	47·7	11·4	53·4	83	243	5·7	11	1·98
June ...	63·2	51·9	11·3	57·6	83	234	6·0	10	1·88
July ...	66·5	55·1	11·4	60·8	83	230	6·2	13	2·12
August ...	67·1	55·8	11·3	61·4	82	243	5·5	12	2·17
September ...	64·4	54·4	10·0	59·4	84	175	6·3	14	2·67
October ...	57·3	48·7	8·6	53·0	84	125	6·6	19	4·06
November ...	52·8	45·7	7·1	49·3	86	65	7·5	22	4·82
December ...	47·7	40·7	7·0	44·2	87	57	7·5	18	3·34

## MEANS FOR TEN YEARS.—QUARTERLY AND YEARLY.

Station, GUERNSEY, CHANNEL ISLANDS. Height above Mean Sea Level, 180 feet.

F. C. CAREY, M.D., F.R.Met.Soc., Observer.

QUARTERS AND YEARS.	TEMPERATURE OF AIR.			Mean Temperature of Air.	Mean Relative Humidity (9 a.m.).	Amount of Sunshine.	Mean Cloud (9 a.m.).	RAIN.	
	Mean of Highest.	Mean of Lowest.	Mean Daily Range.					Days it fell.	Inches.
	°	°	°	°	%	<sup>2</sup> hrs.			
Jan.—March ...	47·5	39·9	7·6	43·7	87	304	7·1	47	7·53
April—June ...	58·4	47·6	10·8	53·0	83	665	6·0	34	5·82
July—Sept. ...	66·0	55·1	10·9	60·5	83	648	6·0	39	6·96
Oct.—Dec. ...	52·6	45·0	7·6	48·8	86	247	7·2	59	12·22
Whole year ...	56·1	46·9	9·2	51·5	85	1864	6·6	179	32·53

<sup>1</sup> The sunshine observations were made at St. Aubyn's, Jersey.

<sup>2</sup> The sunshine observations were made at St. Aubyn's, Jersey.

## THE CLIMATE OF SOMERSET

By J. MITCHELL BRUCE, M.D., F.R.C.P.

THE important position occupied by Somerset in connection with the present inquiry has but little relation to the features of the county as a whole, but is mainly referable to two other circumstances. In the first place, within its northern boundary is situated the city of Bath, in so many respects the most interesting of our native spas. In the second place, the coast of Somerset presents a series of popular health resorts—Minehead, Weston-super-Mare, Clevedon, Burnham and others, of considerable importance. Of the places named, Bath will be found fully described along with the other spas. The greater part of the present section will be occupied with separate accounts of the coast towns which we have just named. By way of introduction to these, it will be well to make a rapid sketch of the county as a whole, which, although it is not recognised as a place of special resort in or after illness, possesses many parts of natural beauty and others of unusual interest geologically or historically.

The physical characters of the county are very diverse. Its western extremity is occupied by the greater part of Exmoor Forest. Much of mid-Somerset, on the other hand, particularly along the Parrett, consists of tracts of drained and dyked land, below the level of the highest tides. Running mainly from north-west to south-east are four nearly parallel ranges of picturesque hills, rising to a height of 800 to nearly 1,300 feet in some places—the Black Downs, the Quantocks, the Polden Hills, and the Mendips. Great valleys present every variety of pastoral and sylvan scenery; in other parts broad table-lands are covered with



cultivated fields and timber. The most important streams of Somerset—the Avon, the Parrett, the Brue, and the Axe—have a westerly course, ending in the Bristol Channel, but the Exe and some of the Dorsetshire streams also rise in this county.

**Geology and Soil.**—Somerset presents a remarkable number of geological systems, blended with each other in close and complex relations, and ranging from the old red sandstone to postpliocene drift. The Devonian and the carboniferous series, and various other formations, enter the county along its south-western border, whilst the oolite is continuous with that of Dorset, which bounds it on the south-east (see DORSET). The middle part of the coast and considerable tracts of mid-Somerset, extending as far inland as Glastonbury, present the familiar features of recent alluvial deposit on the sea-level. The northern portion of the county is occupied by the coal measures, carboniferous limestone, and red marl and sandstone, covered by formations of less remote origin.

**Exposure and Natural Protection ; Meteorology.**—The prevailing winds in Somerset are from the south-west and west and to these the coast is much exposed.

The endless variety of hill and valley and the abundant growth of trees afford an equal variety of local shelter in different parts of the county.

The only station of the Royal Meteorological Society in Somerset is Weston-super-Mare. The meteorological records of this place will be found summarised in the special description of it given at page 118. The records of the principal meteorological observations made for some years at Minehead and Clevedon are given at pages 123 and 129. Beyond these figures there are none at our disposal.

The general climatological features of the county appear to be—mildness of temperature, a fair amount of sunshine, the relatively large rainfall characteristic of the south-western counties, and a considerable prevalence of westerly winds, particularly in the spring months.

**Prevailing Diseases, Death-rate, and Causes of Death.**

—The following tables present the returns of the Medical Officers of Health for the different sanitary districts of Somerset for the year 1892 :—

TABLE I.

POPULATION AND NEW CASES OF INFECTIOUS SICKNESS, COMING TO THE KNOWLEDGE OF THE MEDICAL OFFICERS OF HEALTH FOR SOMERSET FOR THE YEAR 1892, CLASSIFIED ACCORDING TO DISEASES, AGES, AND LOCALITIES.

	POPULATION AT ALL AGES.	NEW CASES OF SICKNESS, COMING TO THE KNOWLEDGE OF THE MEDICAL OFFICER OF HEALTH.										
		Estimated to middle of 1892.	Aged under 5 or over 5.	Smallpox.	Scarlatina.	Diphtheria.	Membranous Croup.	FEVERS.			Erysipelas.	Measles.
								Typhus.	Enteric or Typhoid.	Puerperal.		
		(e)										
1. Bridgwater	...	Under 5	...	...	...	...	...	...	...	...	...	...
		5 upwards	...	...	...	...	...	...	...	...	...	...
2. Barnham	2,368	Under 5	...	3	...	...	...	...	...	...	...	...
		5 upwards	...	5	...	...	...	...	...	...	...	...
3. Chard	2,575	Under 5	...	...	...	...	...	...	...	...	...	...
		5 upwards	...	...	...	...	...	...	...	...	2	...
4. Clevedon	...	Under 5	...	1	2	...	...	...	...	...	...	...
		5 upwards	...	8	...	...	...	4	...	...	...	...
5. Frome	...	Under 5	...	86	1	...	...	3	1	14	...	...
		5 upwards	...	...	...	...	...	...	...	...	...	...
6. Glastonbury	...	Under 5	...	2	...	...	...	...	...	...	...	...
		5 upwards	...	11	...	...	...	1	...	3	...	...
7. Midsomer Norton...	5,180	Under 5	...	29	...	...	...	1	...	...	...	...
		5 upwards	...	...	...	...	...	...	...	...	...	...
8. Minehead	2,100	Under 5	...	2	...	...	...	...	...	...	...	...
		5 upwards	...	5	1	...	...	...	...	1	...	...
9. Portishead	2,500	Under 5	...	...	...	...	...	...	...	...	...	...
		5 upwards	...	1	1	...	...	1	...	...	...	...
10. Radstock	3,438	Under 5	...	...	...	1	...	...	...	...	1	...
		5 upwards	...	7	...	...	...	11	...	8	...	...
11. Shepton Mallet	5,501	Under 5	...	27	...	...	...	...	...	...	...	...
		5 upwards	...	48	5	...	...	24	...	11	...	...
12. Street	3,642	Under 5	...	1	...	1	...	...	...	...	...	...
		5 upwards	...	1	...	...	...	1	...	2	...	...
13. Taunton	...	Under 5	...	...	...	...	...	...	...	...	...	...
		5 upwards	...	17	41	...	...	2	...	16	...	...
14. Wellington	6,898	Under 5	...	16	2	...	...	...	...	...	...	...
		5 upwards	...	39	4	...	...	2	2	4	...	...
15. Wells	...	Under 5	...	35	1	...	...	...	...	...	1	...
		5 upwards	...	...	...	...	...	...	...	...	1	...
16. Weston-super-Mare	16,150	Under 5	...	4	...	...	...	...	...	2	...	...
		5 upwards	...	47	7	...	...	3	...	9	...	...
17. Wiveliscombe	...	Under 5	...	...	...	...	...	...	...	...	...	...
		5 upwards	...	3	...	...	...	...	...	...	...	...
18. Yeovil	...	Under 5	...	...	...	...	...	...	...	...	...	...
		5 upwards	...	...	...	...	...	...	...	...	...	...



TABLE II.  
ABSTRACTS OF MORTALITY RETURNS OF THE MEDICAL OFFICERS OF HEALTH FOR SOMERSET FOR 1892.

[illegible]

**Therapeutic Effects and Uses.**—Apart from Bath and the coast towns, which are deservedly famous in their several ways, as separately described, Somerset no doubt contains many places that afford pleasant and valuable change to the town-dweller in the holiday season. There are also parts within its borders of at least local reputation as resorts for naturally delicate persons, and for those who have been debilitated by acute disease, or are regaining strength after operation.

It is not considered necessary to enter into these details in the present report.

### WESTON-SUPER-MARE.

WESTON-SUPER-MARE is situated on the southern slope of Worlebury Hill, a wooded spur of the Mendips, where it meets the shore of the Bristol Channel, and on Uphill Bay which stretches immediately south of this point, between it and Brean Down. The part of the town on the face of the hill is residential; the part which fringes the bay is mainly occupied by visitors, whilst the intermediate streets are devoted to business.

Worlebury and Brean Downs belong to the carboniferous limestone of the Mendip Hills, which yields an absorbent dry soil, drying quickly after rain. The great level below belongs to the post-pleiocene drift. The houses built on the slope of the hill are well protected by it from the north and east; and extensive woods behind the town add greatly to the shelter. These natural features, the views of the Welsh coast, and the great expanse of the channel with its shipping and fortified islands, give interest and cheerfulness to the outlook on every quarter.

The sea of Weston Bay has features of its own, which are not altogether attractive. The water is gray and dull, suggestive of the mouth of a great river rather than of the ocean; and when it recedes at low tide it leaves behind it a great sweep of muddy shore. It must be admitted that this feature of the place, unpleasant though it may be at first sight to the eye, is in no sense offensive. The whole is bounded by a continuous sea-front or esplanade. Rowing and sailing may be safely enjoyed.

**Climate and Meteorology.**—The meteorology of Weston-



super-Mare is fully set forth in Tables I. and II., which give all the important means for the ten years 1881—1890.

TABLE I.

MEANS FOR TEN YEARS, 1881-90.—QUARTERLY AND YEARLY.

Station, WESTON-SUPER-MARE, SOMERSET. Height above Mean Sea Level, 20 feet.

W. E. PERRETT, Observer.

QUARTERS AND YEAR.	TEMPERATURE OF AIR.			Mean Temperature of Air.	Mean Relative Humidity, 9 a.m.	Amount of Sunshine.	Mean Cloud, 9 a.m.	RAIN.	
	Mean of Highest.	Mean of Lowest.	Mean Daily Range.					Days it fell.	Inches.
Jan.—March ...	46.2	36.3	9.9	41.3	87	..	7.5	43	5.65
April—June ...	59.1	46.1	13.0	52.6	79	..	6.5	40	6.14
July—Sept. ...	65.9	53.6	12.3	59.7	81	..	6.6	46	8.40
Oct.—Dec. ...	50.6	41.1	9.5	45.8	87	..	7.5	49	8.68
Whole year ...	55.5	44.3	11.2	49.9	84	..	7.0	178	28.87

TABLE II.

MONTHLY MEANS FOR TEN YEARS, 1881-90.

MONTH.	TEMPERATURE OF AIR IN MONTH.			Mean Temperature of Air in Month.	Mean Relative Humidity, 9 a.m.	Amount of Sunshine.	Mean Cloud, 9 a.m.	RAIN.	
	Mean of Highest.	Mean of Lowest.	Mean Daily Range.					Days it fell.	Inches.
January ...	44.9	36.1	8.8	40.5	90	..	8.0	17	2.23
February ...	45.8	36.2	9.6	41.0	88	..	7.6	13	1.57
March ...	48.0	36.7	11.3	42.3	84	..	6.9	13	1.85
April ...	53.1	40.4	12.7	46.7	80	..	6.7	13	1.95
May ...	59.5	46.2	13.3	52.9	79	..	6.5	15	2.04
June ...	64.8	51.7	13.1	58.2	79	..	6.4	12	2.15
July ...	66.9	55.1	11.8	61.0	78	..	6.7	17	2.90
August ...	67.0	54.4	12.6	60.7	80	..	6.3	15	2.91
September ...	63.8	51.3	12.5	57.5	84	..	6.9	14	2.59
October ...	56.0	45.3	10.7	50.6	85	..	6.9	16	3.02
November ...	50.7	41.8	8.9	46.3	88	..	7.8	18	3.23
December ...	45.0	36.3	8.7	40.6	89	..	7.7	15	2.43

An analysis of these tables and other records discovers several points of special interest in connection with the climate, which may be conveniently given here:—

1. The mean temperature at 9 a.m. for the year is  $49\cdot8^{\circ}$ , one degree higher than London, and the same as that of Ramsgate.

2. The mean temperature at 9 a.m. for the six winter months, October to March, is  $43^{\circ}$ , as compared with  $41\cdot06^{\circ}$  at London and  $42\cdot1^{\circ}$  at Ramsgate.

3. The mean temperature at 9 a.m. for the six spring and summer months, April to September inclusive, is exactly the same as that of London— $55\cdot6^{\circ}$ .

Frosts are said to be less severe here than in most places; and snow rarely lies longer than one or two days.

4. The mean rainfall for the year is  $28\cdot87$  inches, as compared with  $25\cdot17$  inches at London. The number of rainy days is 178, against 165 in London.

There is abundant movement of the air at Weston—indeed the winds may be described as usually being somewhat keen here; and in the early spring and autumn strong south-westerly and westerly gales blow.

**Sanitation. Drainage. Water Supply.**—Weston is very thoroughly drained by means of a system of sewers which discharge into the Channel at ebb tide about two miles from the town. The main drains are fitted with flushing arrangements, and the high tides in this region (rising 38 feet at the pier-head) effectually remove the sewage.

The water supply is constant and abundant, derived from wells in the limestone rocks, and pumped into reservoirs for distribution through the town. The water is free from organic impurities, but it is very hard; and local authorities recommend rheumatic and gouty persons to boil and filter it before use. A certain number of houses, however, still use private well water, occasionally found to be contaminated.

**Health. Prevalence of Diseases. Mortality.**—Anæmia is very common in Weston-super-Mare; debility not so, the place being regarded as "bracing." Scrofula is rare, and scrofulous affections of bones and joints in children do well. Phthisis is said to be uncommon, and its limited forms are benefited by residence at Weston.

Bronchitis and catarrh are prevalent amongst the residents; whilst pneumonia and pleurisy are the reverse. Asthma is also uncommon, and asthmatic visitors are much benefited. Kidney



diseases, including acute and chronic Bright's disease and gravel and calculus, are all described as rare, the occurrence of calculus being "phenomenal." Chronic albuminuria with large white kidney seems to be benefited by this climate. On the other hand, acute and chronic rheumatism and neuralgia are decidedly prevalent. Eczema, not common, is regarded as intractable. Malaria does not occur. Endemic sore throat is fairly prevalent. Diarrhœa prevails in the summer, causing a certain number of deaths.

The following official table relates to the prevalence of the acute infectious diseases during 1892:—

WESTON-SUPER-MARE.		NEW CASES OF SICKNESS COMING TO THE KNOWLEDGE OF THE MEDICAL OFFICER OF HEALTH.								
Population of all Ages estimated to middle of 1892.	Aged under Five or over Five.	Smallpox.	Scarlatina.	Diphtheria.	Membranous Croup.	Fevers.			Erysipelas.	Measles.
						Typhus.	Enteric or Typhoid.	Puerperal.		
16,150	Under Five ...	...	4	...	...	...	...	...	2	...
	Over Five ...	...	47	7	...	...	3	...	9	...

The common causes of death may be learned from the following table, extracted from the official report for 1892:—

MORTALITY FROM ALL CAUSES AT SUBJOINED AGES.							MORTALITY FROM SUBJOINED CAUSES, DISTINGUISHING DEATHS OF CHILDREN UNDER FIVE YEARS OF AGE.																			
At all ages.	Under 1 Year.	1 and under 5 Years.	5 and under 15 Years.	15 and under 25 Years.	25 and under 65 Years.	65 Years and upwards.		Smallpox.	Scarlatina.	Diphtheria.	Membranous Croup.	Fevers.			Cholera.	Erysipelas.	Measles.	Whooping Cough.	Diarrhoea and Dysentery.	Rheumatic Fever.	Phthisis.	Bronchitis, Pneumonia, and Pleurisy.	Heart Disease.	Injuries.	All other Diseases.	Total.
												Typhus.	Enteric and Typhoid.	Puerperal.												
262	49	15	12	13	85	58	Under Five	...	...	...	...	...	...	...	...	1	8	9	...	...	...	12	...	...	19	49
							Over Five	...	...	3	...	...	...	...	...	1	7	5	1	16	41	33	1	105	213	

The following are the death-rates and the zymotic death-rate for three successive years:—

	1890	1891	1892
Death Rate... ..	15·66	16·19	16·2
Zymotic Death Rate ...	1·1	·03	2·0

**Therapeutic Effects and Uses.**—Weston-super-Mare occupies the first place as a seaside resort in summer and autumn for the people of the inland parts and towns of the west of England. Its fresh open situation and the full development which it presents of the attractions commonly associated with the coast, including bathing, boating, sailing, lounging on the beach and pier, and walking and driving in the neighbourhood, have combined to establish its popularity. This has been further proved in a practical form by the erection in it of the West of England Sanatorium, a large institution on the shore, receiving more than 1,000 convalescents annually.

Of persons actually requiring treatment, those who are most likely to be benefited by a period of residence at Weston are sufferers from the effects of excessive mental strain, from nervous disorders generally, and from neuralgia in particular, if it be referable to "constitutional," not local, causes. In the late autumn and greater part of winter cases of early phthisis and of dry catarrh may be expected to do well here, and delicate persons requiring a warm, equable, but dry and bracing climate. Such subjects should arrange to leave Weston by the beginning of March, to escape the trying winds. Cases of advanced phthisis ought not to be sent here excepting in summer.

Amongst other patients who ought not to visit Weston-super-Mare are persons suffering from rheumatism, because rheumatism is common here. This caution is not unnecessary, as Weston lies so near Bath.

The Committee desires to thank Drs. Smith and Spencer and Messrs. Hitchins and Houghton for assistance in collecting material for this report.



## MINEHEAD.

Minehead, a village of about 2,000 inhabitants, occupies a picturesque situation on a small bay with an easterly exposure in the Bristol Channel, at the foot of the North Hill, the last northerly offshoot of the Exmoor Hills towards the sea. Minehead comprises three separate parts, occupying different aspects of the site—from the sea upwards to the hill. What is known as the Quay-town is built on the flat sandy shore, along which stretch reclaimed meadows and golf links. Above the Quay is the Lower Town, and above this again is the Higher Town, clustering round the old church. All three divisions are of very modest extent. The background is formed by the spurs of the hills, broken by coombes and affording a variety of protection from the south-east, south, south-west, west, north-west and north; high behind all is the fringe of the great moor. Winding round the southern slopes of North Hill, 800 feet high, which shelters Minehead from the north, are the Parks, which are exposed to the sun from morning till evening.

The sea presents the dull grayish appearance familiar in the waters of the Bristol Channel. The coast is flat and shingly, and much used for bathing.

The hills are composed of old red sandstone; and the lower parts are covered with *débris* of the same, lying on a bed of shingle, fifty feet in depth. The soil is therefore highly porous, quickly drying after rain. The country supports an abundant growth of timber and vegetation generally, and presents many beautiful green lanes and grassy walks along the coombes. All the year round there are grown in the open air the myrtle, camellia, pomegranate and fig, as well as the fuchsia, magnolia, veronica and acacia; and the lemon plant flowers in the district. During the winter geraniums and calceolarias live in the open air.

**Meteorology.**—The following tables (I. and II.) present the record of the meteorological observations of the late Dr. T. Clark, made principally at Dunster, which is close to Minehead, but situated rather higher and farther from the sea. They cover a period of eleven years, 1878 to 1888 inclusive.

TABLE I.

1878.					1881.				
Months.	BAROMETER.		THERMOMETER.		Months.	BAROMETER.		THERMOMETER.	
	Max.	Min.	Max.	Min.		Max.	Min.	Max.	Min.
January...	30·63	29·54	58·	35·	January...	30·53	28·75	52·	24·
February...	30·63	29·60	58·	36·	February...	30·28	29·05	54·	34·
March...	30·65	29·24	59·	36·	March...	30·59	29·07	58·	34·
April...	30·18	29·18	64·	41·	April...	30·30	29·70	64·	37·
May...	30·16	29·27	70·	53·	May...	30·74	29·63	70·	45·
June...	30·26	29·35	87·	54·	June...	30·36	29·56	74·	52·
July...	30·44	29·75	85·	60·	July...	30·38	29·47	79·	59·
August...	30·35	29·44	76·	60·	August...	30·38	29·50	79·	55·
September...	30·34	29·49	76·	52·	September...	30·33	29·39	66·	53·
October...	30·30	29·14	71·	45·	October...	30·56	29·28	60·	41·
November...	30·42	29·33	53·	37·	November...	30·41	29·22	63·	43·
December...	30·31	29·25	55·	29·	December...	30·64	29·10	55·	35·
Average...	30·39	29·38	67·8	44·	Average...	30·46	29·31	65·	42·8
1879.					1882.				
January...	30·38	29·38	52·	28·	January...	30·95	29·28	55·	38·
February...	30·16	28·88	56·	30·	February...	30·90	29·4	59·	38·
March...	30·52	29·50	57·	33·	March...	30·67	28·92	65·	37·
April...	30·34	29·16	58·	36·	April...	30·35	28·90	64·	44·
May...	30·54	29·53	68·	43·	May...	30·51	29·39	69·	48·
June...	30·18	29·49	70·	54·	June...	30·35	29·68	73·	52·
July...	30·21	29·45	77·	55·	July...	30·49	29·33	73·	58·
August...	30·17	29·43	72·	57·	August...	30·42	29·35	79·	55·
September...	30·52	29·40	70·	54·	September...	30·44	29·25	69·	50·
October...	30·53	29·70	62·	44·	October...	30·56	29·24	69·	42·
November...	30·63	29·64	57·	35·	November...	30·15	29·22	64·	31·
December...	30·78	29·20	58·	30·	December...	30·27	29·14	56·	28·
Average...	30·41	29·51	63·1	41·7	Average...	30·50	29·92	63·3	43·5
1880.					1883.				
January...	30·61	29·95	56·	25·	January...	30·51	29·15	56·	36·
February...	30·37	28·64	56·	38·	February...	30·87	29·20	55·	35·
March...	30·47	29·24	59·	37·	March...	30·68	29·29	53·	30·
April...	30·47	29·29	63·	44·	April...	30·65	29·25	62·	39·
May...	30·52	29·70	71·	49·	May...	30·44	29·48	71·	42·
June...	30·31	29·54	80·	53·	June...	30·49	29·74	75·	52·
July...	30·69	29·40	77·	60·	July...	30·23	29·51	74·	59·
August...	30·38	29·41	81·	60·	August...	30·35	29·68	77·	60·
September...	30·50	29·19	81·	52·	September...	30·25	28·55	70·	53·
October...	30·42	29·23	65·	41·	October...	30·55	29·29	67·	46·
November...	30·46	28·74	59·	29·	November...	30·24	28·90	58·	39·
December...	30·65	28·96	56·	35·	December...	30·57	29·65	66·	35·
Average...	30·49	29·19	67·	43·7	Average...	30·48	29·31	64·8	46·



TABLE I.—*continued.*

1884.					1886— <i>continued.</i>				
Months.	BAROMETER.		THERMOMETER.		Months.	BAROMETER.		THERMO	
	Max.	Min.	Max.	Min.		Max.	Min.	Max.	
January ..	30·62	29·00	56·	36·	August ...	30·29	29·45	82·	
February .	30·44	29·30	58·	34·	September	30·43	29·59	74·	
March ...	30·20	29·24	64·	32·	October ...	30·31	28·80	69·	
April .....	30·10	29·13	60·	40·	November	30·68	29·01	60·	
May .....	30·44	29·38	77·	48·	December	30·33	28·30	57·	
June .....	30·38	29·55	78·	49·	Average...	30·37	29·16	67·7	
July .....	30·22	29·60	77·	58·	1887.				
August ...	30·28	29·70	82·	55·	January...	30·64	28·78	64·	
September	30·35	29·50	75·	52·	February .	30·64	29·64	58·	
October ...	30·68	29·38	65·	42·	March ...	30·60	29·13	57·	
November	30·52	29·70	61·	37·	April .....	30·66	29·24	61·	
December	30·22	29·00	56·	36·	May .....	30·43	29·47	67·	
Average...	30·37	29·37	67·5	43·	June .....	30·47	29·68	83·	
1885.					July .....	30·40	29·55	82·	
January...	30·34	28·85	55·	33·	August ...	30·40	29·62	82·	
February .	30·10	29·07	58·	32·	September	30·50	29·12	74·	
March ...	30·55	29·26	57·	37·	October ...	30·64	29·32	61·	
April .....	30·30	29·10	65·	36·	November	30·30	28·75	53·	
May .....	30·16	29·28	68·	43·	December	30·45	29·20	54·	
June .....	30·42	29·58	76·	55·	Average...	30·51	29·29	66·2	
July .....	30·43	29·86	84·	57·	1888.				
August ...	30·35	29·60	73·	54·	January...	30·66	29·12	52·	
September	30·31	29·42	72·	50·	February .	30·39	29·46	53·	
October ...	30·14	28·88	62·	45·	March ...	30·27	28·58	58·	
November	30·27	29·14	57·	35·	April .....	30·24	29·45	59·	
December	30·56	29·40	53·	33·	May .....	30·45	29·39	70·	
Average...	30·33	20·19	65·	42·6	June .....	30·21	29·52	75·	
1886.					July .....	30·17	29·39	72·	
January...	30·12	28·96	53·	24·	August ...	30·30	29·50	77·	
February .	30·64	29·40	50·	31·	September	30·47	29·66	71·	
March ...	30·30	29·16	62·	30·	October ...	30·37	22·28	67·	
April .....	30·30	29·13	69·	40·	November	30·25	28·08	60·	
May .....	30·45	29·10	72·	43·	December	30·44	29·74	58·	
June .....	30·30	29·62	81·	51·	Average...	30·35	29·26	64·4	
July .....	30·37	29·44	82·	59·					

## MEANS OF ELEVEN YEARS.

Barometer (maximum) 30·47 in., minimum 29·35 in.  
 Thermometer (maximum) 65·6°, minimum 43·1°.

## METEOROLOGY OF MINEHEAD

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TABLE II.

1877.						1878.					
MONTH.	HYGRO-METER.		RAIN.		BLUE SKY.	MONTH.	HYGRO-METER.		RAIN.		BLUE SKY.
	Dry.	Wet.	Inches.	Days.	Days.		Dry.	Wet.	Inches.	Days.	Days.
January ...	45	44	6.30	21	10	January ...	45	42	2.06	10	4
February ...	46	45	2.34	14	10	February ...	43	42	2.01	8	6
March .....	43	40	2.50	9	8	March .....	47	43	1.79	11	9
April .....	47	45	3.48	11	9	April .....	49	47	2.96	18	10
May .....	51	48	2.83	9	20	May .....	56	53	5.04	16	13
June .....	60	56	1.35	6	19	June .....	60	56	1.89	6	20
July .....	61	58	4.07	7	18	July .....	63	57	2.15	5	18
August .....	62	59	4.20	10	15	August .....	63	60	3.72	12	11
September .	55	52	2.49	8	11	September .	59	57	2.66	8	13
October ...	53	50	3.21	9	13	October ...	54	51	6.51	13	11
November .	48	46	7.06	14	14	November .	42	40	3.47	7	10
December .	45	42	2.57	10	7	December...	37	36	2.51	8	9
Means and Totals ...	51	49	42.34	128	153	Means and Totals ...	51	49	36.77	122	138
1879.						1889.					
MONTH.	HYGRO-METER.		RAIN.		BLUE SKY.	MONTH.	RAIN.				
	Dry.	Wet.	Inches.	Days.	Days.						
January ...	36	34	3.32	9	5	January ...	0.96				
February ...	41	40	4.43	15	13	February ...	2.31				
March .....	42	46	0.79	4	15	March .....	3.65				
April .....	41	39	2.56	12	15	April .....	1.56				
May .....	49	47	2.74	9	12	May .....	3.67				
June .....	58	56	4.51	16	10	June .....	0.33				
July .....	59	56	1.94	7	9	July .....	1.10				
August .....	61	59	4.35	9	16	August .....	2.29				
September .	57	56	2.49	8	13	September .	1.10				
October ...	52	50	1.54	4	4	October .....	2.01				
November .	44	42	.64	3	10						
December ..	32	32	1.45	4	10						
Means and Totals ...	47	46	30.76	100	132						



An analysis of these records brings out four points with special prominence:

1. That the average maximum temperature for eleven years (1878-1888) is  $65.6^{\circ}$  (!); the mean minimum temperature for eleven years  $43.1^{\circ}$ .

2. That the range of temperature is very moderate.

3. That the relative humidity is low; and that the barometer is comparatively high and steady.

4. That the rainfall is 36.62 inches per annum (mean of three years only), as compared with 25.17 inches in London (mean of ten years).

**Sanitation.**—Minehead is abundantly supplied with pure water from springs in the hills.

The town is drained into the sea. The main sewer is well ventilated, flushed at several points, and carried into deep water.

**Mortality, &c.**—Table III. on the opposite page contains the official report of the prevalence of infectious diseases and the causes of death at Minehead during the year 1892. All the seven cases of scarlet fever were imported. The single case of diphtheria was introduced from London. No death was due to phthisis.

The native residents of this district are remarkably healthy. Wounds heal with great ease. After surgical operations hardly any disinfectants are needed. Freedom from illness has been specially noted during the prevalence of the pure east wind.

Among the poorer classes there is some anæmia, very little phthisis, and practically speaking no enteric fever. Scarlet fever was formerly prevalent. During the last twenty years there have only been two very mild epidemics. Diphtheria is very seldom seen. Ague is unknown. Among those who permanently reside here for the sake of health are several sufferers from bronchial asthma. They remain free from their chest trouble. Patients liable to spasmodic asthma seldom have any paroxysms. A patient previously affected with hay-fever has had no return of the complaint during his eight years' residence; another only when walking on the golf links.

There is very little phthisis amongst the inhabitants. Unless

TABLE III.

[illegible]



advanced, the disease does well here, and some cases are regarded as having quite recovered. Among several instances of hæmorrhagic phthisis, very few recurrences of hæmorrhage have taken place.

The climate is beneficial to cases of neurasthenia and of insomnia. It appears to have a sedative effect in heart-disease.

Under the influence of the east wind, rather than during moister periods, chronic rheumatism of old age prevails. Of rheumatic fever only six cases were seen by Dr. Clark during twenty years.

**Therapeutic Effects and Uses.**—The climatic features of Minehead which render it valuable as a health resort are mainly connected with its peculiar geographical position. Situated on the south-west coast, it yet possesses an easterly exposure, and is under the influence of the air both of the high moor beside it and of the sea. It is, further, protected from the north and north-west, and in great measure from the south-west, the direction of prevailing winds. Presenting these characters, it is at once sheltered and comparatively bracing in winter, and cool in summer.

Minehead is a popular resort with three classes of visitors:

(1) It is a favourite centre for members of the Exmoor Hunt, from August to December. During the earlier part of the season it is not uncommon for families from a distance, London included, to reside for a few weeks at Minehead, the father hunting and the children enjoying the benefits of change and sea bathing.

(2) Minehead is one of the places visited by the summer tourist in his excursions on Exmoor and North Devon generally, Lynton being but a few stages distant by coach.

(3) In more immediate connexion with our present inquiry Minehead has to be regarded as a winter resort for invalids. These, however, are still but a small class, and appear to be mainly sufferers from chronic bronchitis. Both in the class of cases of this disease characterized by free expectoration, in the dry variety, and in at least some instances where spasm is a prominent feature, Minehead has proved distinctly beneficial; and there are few places on our coasts that present more attractive and promising features. There is no special therapeutical indication for sending phthisis here; but the good opinion entertained of the effects of the climate in some chronic forms of the disease appears to be

well-founded. Cardiac disease has also been observed to do well at Minehead, particularly cases with symptoms of restlessness or irritability. In the same connexion it is worthy of remark that insomnia from overwork sometimes rapidly disappears under the influence of the restfulness of this place.

### CLEVEDON.

Clevedon is a small town of 5,412 inhabitants, situated on the northern part of the coast of Somerset, at the foot of a series of steep hills which abut upon the shore of the Bristol Channel, thirteen miles from Bristol.

"There twice a day the Severn fills ;"

for Clevedon is the

"place of rest  
By that broad water of the west"

immortalised by Tennyson's *In Memoriam*.

The aspect of the town is north-westerly, with the Welsh coast on the horizon. It stands upon a spur of carboniferous limestone which runs from Bristol to the coast; and the soil and subsoil, of the same material, afford good natural drainage. The place is well protected from northerly and easterly winds by the hills behind it and by abundant woods. It possesses a fair beach for bathing and a pier; and both it and the neighbourhood afford many charming walks and drives.

The houses are mainly detached villas, standing in their own gardens.

**Meteorology.**—The only available records of the meteorology of Clevedon relate to the rainfall. They are given in the following table.<sup>1</sup>

Average rainfall in Clevedon for the years 1870–1893 inclusive :—

January ... ..	2.59	July ... ..	3.23
February ... ..	1.99	August ... ..	3.36
March ... ..	1.78	September ... ..	3.13
April ... ..	1.78	October ... ..	3.71
May ... ..	2.14	November ... ..	3.23
June ... ..	2.09	December ... ..	2.51
For the Year ... ..		31.54	

<sup>1</sup> Furnished by the kindness of Mr. Button, Clevedon.



The prevailing winds are from the west and south-west. Although no exact observations have been made of the hours of bright sunshine, Clevedon may be described as a sunny place. The euonymus, myrtle, pomegranate, laurestinus and all such shrubs flourish here close to the sea. Fogs are uncommon.

The system of drainage is by sewers, well ventilated and supplied with automatic flushing tanks at all the mains.

The sewers discharge into the sea at two points, the principal outfall being at an unfrequented spot a considerable distance from the town.

The water supply is unlimited, and the water is excellent in quality, being clean, bright and tasteless, and containing lime but no organic matters. It is pumped up from a spring in the rock to a closed-in reservoir on a high hill, from which it is distributed over the place through iron pipes.

**Prevalence of Disease.**—Anæmia and debility are neither frequent nor severe here; and visitors suffering from them usually improve. Scrofula is very rare. Phthisis is not common in Clevedon. Bronchitis and catarrh though frequent are usually of a mild type. Both pneumonia and pleurisy are rare and of mild types. Asthma is uncommon amongst residents; but persons subject to asthma appear to suffer severely here. Acute renal dropsy is hardly ever seen; chronic Bright's disease in its different forms is said to be "scarce"; gravel is not usual; and calculus is unknown. Rheumatism and rheumatic arthritis are uncommon, and rheumatic subjects improve here. Eczema is mild and tractable as a rule. Malaria is unknown in Clevedon. With respect to the zymotic diseases, the following is the return for 1892 of the Medical Officer of Health:—

"Two cases of diphtheria, both fatal; one was imported, and in neither case did the disease spread. Nine cases of scarlet fever, with three deaths; most of these cases were imported. . . . Four cases of enteric fever . . . no death. Influenza . . . prevalent, but in a mild form . . . four deaths. Diarrhœa is uncommon."

The common causes of death may be more accurately gathered from the tabulated official report for 1892, which is as follows:—

INFECTIOUS SICKNESS AND MORTALITY AT CLEVEDON 131

POPULATION OF ALL AGES,  Estimated to Middle of 1892.	AGED UNDER 5 OR OVER 5.	NEW CASES OF SICKNESS COMING TO THE KNOW- LEDGE OF THE MEDICAL OFFICER OF HEALTH.										MORTALITY FROM ALL CAUSES AT SUBJOINED AGES.										MORTALITY FROM SUBJOINED CAUSES, DISTINGUISHING DEATHS OF CHILDREN UNDER FIVE YEARS OF AGE.													
		FEVERS.										FEVERS.										FEVERS.													
		Smallpox.	Scarlatina.	Diphtheria.	Membranous Group.	Typhus.	Euteric or Typhoid.	Puerperal.	Erysipelas.	Measles.	At all Ages.	Under 1 Year.	5 and under 5.	5 and under 15.	15 and under 25.	25 and under 65.	65 and upwards.)	Smallpox.	Scarlatina.	Diphtheria.	Membranous Group.	Typhus.	Euteric or Typhoid.	Puerperal.	Cholera.	Erysipelas.	Measles.	Whooping Cough.	Diarrhoea or Dysentery.	Rheumatic Fever.	Phthisis.	Bronchitis, Pneumonia, and Pleurisy.	Heart Disease.	Injuries.	All other Diseases.
Under 5 .....	1	2	3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	2	...	...	...	...	...	...	...	2	...	1	1	...	...	14	21	
Over 5 .....	8	...	...	...	...	4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	8	9	12	1	94	104



Longevity is very frequent in Clevedon. During the winter of 1892-3 seven persons died at the following ages:—91, 82, 91, 83, 73, 87, and 83; and Dr. Theodore Davis, who has been good enough to furnish much of the material for this report, states that he attends four patients over 90 years of age, and one of 94 years.

**Therapeutic Effects and Uses.**—Clevedon is to be therapeutically regarded as a quiet watering-place, with a mild and equable climate, restful, comfortable, and beautiful. It is generally bright and cheerful, with a peculiarly fresh green appearance from the flourishing character of the trees and shrubs which line the streets and form quaint copses in the heart of the town. It is therefore a suitable summer and autumn resort for persons requiring relief from town life. Cases of phthisis appear to be seldom sent here. Rheumatism in its chronic forms is said to be benefited by residence at Clevedon. The climate is peculiarly favourable to old people, and children also thrive here remarkably well.

## THE CLIMATE OF DORSET

BY J. MITCHELL BRUCE, M.D., F.R.C.P.

THE county of Dorset presents many features of interest in connection with its physical characters, geology, meteorology, and climatology in general. It also contains certain places which possess claims to special salubrity and attractiveness. The number of actual health resorts that enjoy more than a local reputation is, however, limited. They include chiefly Weymouth, Swanage, Parkstone and the west portion of the Bournemouth district, on the south coast; and Shaftesbury on the northern border. Dorsetshire as a whole does not appear to call for more than a brief notice in this report.

**Geological and Physical Characters.**—Dorsetshire is situated between Hants on the east, and Devon on the west, and is bounded on the north-east and north-west respectively by Wiltshire and Somerset, whilst its southern border lies on the Channel. Of comparatively limited area, it presents in its different parts geological and physical characters more or less closely resembling those of the larger counties which bound them. If we enter it on its eastern border from the New Forest, and move due west, we cross in regular succession a remarkably complete series of geological systems. As far as a line running from Wimborne to near Dorchester there are the sandy and shingly and clay deposits of the middle and lower eocene familiar to us in the regions of the New Forest and Bournemouth, covered with wild heath and pines, and broken by the flat wide irrigation grounds along the waters of the Stour and the Frome. We next enter on a great continuous belt of chalk country, running almost from the coast on the south-west, through Dorchester and Blandford, to the north-east extremity of the county where it enters Wilts



to the south of Salisbury. The part of this by Dorchester has an undulating somewhat bare aspect, but trending northwards it takes the form of high downs which contribute to the hilly feature that much of Dorset presents. The western border of the chalk is abruptly and continuously bordered by a narrow outcrop of the upper greensand and gault, which attains a high and picturesque development at Shaftesbury and the neighbourhood. Still proceeding westward, we traverse in regular geological order the upper, middle, and lower oolite, in the directions of Templecombe, Sherborne, and Stalbridge. Lastly, before crossing the western border of the county into Devonshire, we encounter the lias between Beaminster and Bridport. In this region are the two highest hills of Dorsetshire, Lewesdon and Pillesdon, which attain an elevation of nearly 1,000 feet.

As a whole the county is hilly; the chalk, the oolite, and the lias all contributing to this striking physical character. On a small scale the surface is equally irregular, consisting of hill and dale, down and valley in every variety of extent and aspect.

The coast of Dorset extends from Bournemouth on the east to Lyme Regis on the west, and is of unusual interest to the geologist. It presents, amongst other places, Poole Harbour, the southern aspect of the Purbeck Hills, St. Alban's Head, Kimmeridge, Lulworth, Weymouth, Portland, and Bridport. All the strata already enumerated are represented—but irregularly—at different parts of the coast.

Dorset is drained mainly towards the south-east into the English Channel by the Stour, the Piddle, and the Frome. The Wey, the Brit, the Char, and the Axe are smaller streams with more southerly courses, further towards the west. The Yeo and the Parrett flow to the north-west into Somerset, through which their waters reach the Bristol Channel.

Situated where it is, and with its hilly surface, Dorsetshire is swept by frequent and often high and rainladen winds from the south-west. But both by natural configuration, and by hedge timber, woods and plantations, abundant local shelter is afforded; and in many places of limited size, so diversified is the surface that protection can be found from every quarter. It will be gathered from the sketch of the geology of the county that the soil is of great variety in the different districts.

The vegetation is very abundant and thriving, particularly trees, shrubs, grass, and flowers; and on the whole it is suggestive for this country of a mild and somewhat moist climate.

**Meteorology.**—The meteorology of Dorset will be most profitably described under the heads of the three places within its borders which are specially noticed—Weymouth, Swanage, and Shaftesbury.

**Prevailing Diseases, Death Rate, and Causes of Death.**—

The tables on pages 136 and 137 present the returns of the Medical Officers of Health for the different sanitary districts of Dorset during 1892.

The zymotic death-rate for 1892 was 4·883 per cent. of deaths from all causes.

**Therapeutic Effects and Uses.**—Regarded as a whole, and apart from the coast and several of the towns which receive separate notice in this report, Dorsetshire cannot be said to possess special claims as a health resort.

Many parts of the county afford pleasing retreats from the noise, the work, and the cares of city life, as well as suitable places for convalescence. Its climate will naturally be more refreshing and restorative in spring and autumn; but even in summer the mean temperature at Weymouth is about 1·2 degrees lower than that of London.

SHAFTESBURY.

The ancient town of Shaftesbury occupies a remarkably bold and picturesque situation on a lofty greensand plateau, one to three miles in breadth, which abuts abruptly with escarpment to west and north on the extensive vale of Blackmoor, and affords an almost complete panorama of the country around.

To the north the prospect is limited only by the Wiltshire Downs. Glastonbury can be seen on the extreme north-west horizon. Towards the west the eye ranges to Sherborne and Stalbridge. On the southern side the horizon is traced by the great chalk downs of Dorset in the direction of Blandford and Dorchester. A nearer spur of these ends abruptly about three miles south of Shaftesbury, as the Melbury Down. On the east and north-east the plateau slopes more gradually towards the valley of the Nadder and Semley, in the direction of Salisbury.



TABLE I.  
NEW CASES OF SICKNESS IN EACH LOCALITY COMING TO THE KNOWLEDGE OF THE MEDICAL OFFICER OF HEALTH.

District.	Small-pox.	Scarlatina.	Diphtheria.	Croup.	Typhus.	Typhoid.	Continued.	Puerperal.	Cholera.	Erysipelas.	Measles.	Influenza.	Remarks.
<b>RURAL.</b>													
Axminster...	No Returns and no Report.	3	1	...	...	1	...	...	...	12	...	...	Severe epidemic of Diphtheria.
Beaminster...	...	5	38	...	...	...	...	...	...	...	...	...	.....
Blanford...	No Report.	...	...	...	...	...	...	...	...	...	...	...	.....
Bradport...	No Entries.	...	...	...	...	...	...	...	...	...	...	...	.....
Cerne Abbas...	6	...	...	...	...	...	...	...	...	1	...	...	.....
Charlton...	...	1	...	...	...	...	...	...	...	...	...	...	No infectious disease in this district.
Dorchester, E...	...	81	25	...	...	...	...	...	...	...	46	...	.....
Dorchester, W...	...	8	...	...	...	...	...	...	...	...	...	...	.....
Ware...	...	36	...	...	...	...	...	...	...	...	...	...	Scarlet Fever prevalent; but few deaths.
Sherborne...	...	10	1	...	...	11	...	...	...	...	...	...	No deaths.
Sturminster Newton...	...	52	14	...	...	...	...	...	...	...	...	...	.....
Wareham...	...	30	2	...	...	...	...	...	...	...	...	...	Scarlet Fever—very severe; also Diphtheria.
Weymouth...	...	104	36	6	...	4	...	...	...	...	...	...	Scarlet Fever—severe.
Wimborne and Cranborne...	...	41	...	...	...	...	...	...	...	...	...	...	.....
Wincanton...	...	...	...	...	...	...	...	...	...	...	...	...	.....
<b>URBAN.</b>													
Blanford...	...	2	3	...	...	1	...	...	...	10	...	...	.....
Bradport...	...	...	...	...	...	...	...	...	...	1	...	...	.....
Dorchester...	...	...	...	...	...	...	...	...	...	...	...	...	.....
Lynne Regis...	No Report.	8	...	...	...	...	...	...	...	1	...	...	Measles—severe and a very fatal type.
Poole...	...	51	6	...	...	...	...	...	...	6	...	...	Influenza in February and March; Scarlatina and Measles at end of year very severe.
Portland...	...	...	...	...	...	...	...	...	...	...	...	...	.....
Sherborne...	No Return.	...	...	...	...	...	...	...	...	...	...	...	.....
Swanage...	No Report.	...	...	...	...	...	...	...	...	...	...	...	Scarlet Fever prevalent.
Wareham...	...	33	5	1	...	5	...	...	...	...	...	...	.....
Weymouth...	...	6	6	...	...	...	...	...	...	...	...	...	.....
Wimborne...	...	...	...	...	...	...	...	...	...	...	...	...	.....
Totals	12	509	145	7	1	32	3	8	1	65	146	1039	.....

TABLE II.  
STATISTICAL RETURNS RELATIVE TO THE PUBLIC HEALTH AND THE DEATH-RATE IN DORSET FOR THE YEAR 1892.

District.	Medical Officer.	Population.	Average.	Total Deaths.	Total Births.	Death Rate per 1,000.	Birth Rate per 1,000.	Small-pox.	Diphtheria.	Croup.	Typhoid.	Fuerber's.	Krysipelas.	Whooping Cough.	Diarrhoea and Dysentery.	Rheumatic Fever.	Phthisis.	Ague.	Bronchitis, Pleurisy, & Pneumonia.	Heart Disease.	Injuries.	Cancer.	Influenza.	All other Diseases.	Totals.
<b>ROYAL SANITARY DISTRICTS.</b>																									
Axminster .....	Dr. Webb.	10,436	53,154	241	276	253	267	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Beaminster .....	" Daniel.	9,422	58,165	185	215	197	22.8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Bridport .....	" "	...	Report	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Cerne Abbas .....	" Dalton.	6,122	45,771	117	155	19.1	25.3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Charl .....	" Stephens.	22,000	55,000	413	413	18.60	29.09	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Dorchester E. ....	" E. Day.	4,947	28,465	88	130	14.2	26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Dorchester W. ....	" Rendall.	5,578	37,045	127	129	16.13	23.12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Ware .....	" Bartlett.	6,766	33,148	151	160	23.3	23.8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Poole .....	" Philpots.	10,570	...	170	347	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Sturminster Newton .....	" Sawyer.	9,718	35,558	172	226	17.69	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Sherborne .....	" Williams.	7,382	39,049	114	143	15.44	19.39	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Weymouth .....	" Leach.	9,583	37,954	138	231	16.5	24.2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Weymouth .....	" Lys.	11,799	95,098	189	390	16.97	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Weymouth .....	" Pridham.	10,560	30,520	163	258	15.43	24.4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Weymouth & Cranborne .....	" Parkinson.	14,500	80,860	267	463	18.6	26.0	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Wincanton .....	" Stockwell.	19,169	60,120	314	431	13.8	20.86	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
<b>URBAN SANITARY DISTRICTS.</b>																									
Blandford .....	Dr. Daniell.	3,937	862	81	113	20.56	28.60	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Bridport .....	" Clibborn.	6,011	573	125	147	18.60	22.23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Dorchester .....	" Day.	8,453	571	153	219	18.3	25.7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Lyme Regis .....	" No Report	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Poole .....	" "	16,463	5,111	329	456	20.70	29.33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Portland .....	" Lawton.	15,254	5,227	153	254	15.3	22.7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Sherborne .....	" McLean.	9,441	3,555	104	140	17.19	21.99	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Swanage .....	" Nutt.	2,668	...	52	75	19.5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Wareham .....	" McCausland.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Weymouth .....	" No Report	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Weymouth .....	" Browning.	15,379	4,425	273	366	14.3	19.9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Wincborne .....	" Parkinson.	5,700	300	69	...	15.0	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Totals .....				4,239	5,620	17.6	25.0	about	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

Weymouth Port Sanitary (Simpson). No deaths in I. D. Hospital. 10 cases treated. 23 vessels visited in Portland Roads. Poole Port Sanitary (Lawton). 77 vessels visited and examined. Five deaths from drowning. 1 Typhus.



On at least three sides of the tableland, north, west, and south, the eye, before it rests on these distant boundaries, is carried a sheer hundred feet over the steep acclivity on which the town is built to a prospect of remarkable extent, variety, and restfulness—of fields, woods, hedgerows, villages, and farms, in a broad undulating valley, with corresponding expanse and grandeur of atmosphere.

**Exposure: Protection from Winds.**—The town of Shaftesbury, standing forward like a great bulwark against the west, is as a whole necessarily without natural shelter. A more windy situation could not be conceived. It is freely exposed to the north, west, and south. But this very variety of aspect affords variety of shelter along the several faces of the acclivity; and in this way it is easy to find local protection from every wind that blows. On all sides there are level walks just below the summit, along the various slopes; and in several places the ascent is broken by coombes, which afford complete shelter by the disposition of their sides and abundant timber. The Melbury Down breaks somewhat the force of the south-east winds; whilst on the north side a belt of plantations has a similar effect on the cold winds from that direction.

**Geology and Soil.**—The bold plateau on which Shaftesbury is built, at a height of 720 feet above sea-level, is the extremity of a blunt spur of the stone and sand of the upper greensand. This system forms here, as elsewhere in Dorset, a continuous fringe to the western border of the chalk, reaching an altitude of between 400 and 800 feet. The extensive vale to the north, west, and south belongs to the adjacent strata of the Kimmeridge oolite clay, Oxford oolite, and Oxford clay. On the northern and southern horizons, as already indicated, is the chalk.

The soil is very dry, from its nature and from the rapid natural drainage secured by the elevated position. In the valley below, the clay approaches very near the base of the cliff.

**Trees and Vegetation.**—Shaftesbury enjoys abundant local shelter by trees and other vegetation around and about the town. Hedge timber and plantations flourish in all directions. Many walks run in deep lanes, or are protected by high hedges, and they frequently lead into woods or along sheltered coombes.

The bay laurel and the fuchsia *globosa* and *gracilis* flourish in Shaftesbury, and are evidence of the character of its climate.

**Climate and Meteorology.**—The only records of the meteorology of Shaftesbury relate to the rainfall during the last few years. All that are available have been kindly placed at the disposal of the committee by the observer, Mr. T. Acland, of High Street, through Mr. Labrum.

TABLE I.  
RAINFALL AT SHAFTESBURY (HIGH STREET).

	Rainfall in Year.	Rainy days in Year.
1888	33·82	186
1889	30·92	179
1890	30·03	181
1891	38·10	189

It is instructive to compare these figures with those obtained at Charlton, two and a half miles to the east, nearer the downs, by Colonel Best, of Charlton House, whose kindness is also acknowledged.

TABLE II.  
RAINFALL AT CHARLTON, TWO AND A HALF MILES TO THE EAST OF SHAFTESBURY, NEARER THE DOWNS, COMPARED WITH THAT AT LONDON AND BOURNEMOUTH.

Rainfall.	Rainy Days.	London (Mr. Symonds).		Bournemouth.	
		Rainfall.	Rainy Days.	Rainfall.	Rainy Days.
34·68	203	27·74	173	31·33	163
32·36	192	23·85	169	26·77	148
31·92	188	21·23	161	25·95	150
45·27	194	28·15	178	35·85	184

"Rainy Days" are days on which 0·01 inch or more fell.

More complete meteorological observations will be made in future.

With respect to winds, there is no question that they are common, and often high, and that they blow most frequently from the south-west and west. Easterly winds also prevail in spring. The sandy roads dry rapidly after rain. Fog is considerable at times.

Like all elevated and exposed places Shaftesbury is most



genial in calm weather. It is never too sultry. There is ready escape from dust in the woods and lanes.

**Drainage.**—Two systems of drainage exist in Shaftesbury. About one half of the town is drained southwards by water carriage to a sewage farm; and this with success, as the natural fall is ample. The other half of the town is provided with cesspools, mostly uncemented at present.

The water-supply is abundant and good, from springs in the greensand. As far as the medical practitioners know, there is neither contamination of the water, nor any evidence of the occurrence of disease referable to contamination.

**Prevalence of Diseases.**—In considering the following statements respecting the diseases prevalent in Shaftesbury, which have been furnished—along with much other information of great value for our purpose—by the courtesy of the local medical practitioners, Mr. Sawyer, M.O.H., Dr. Wilkinson, and Mr. Evans, M.B., it must be borne in mind that they relate to a population which extends beyond the boundaries of the town proper, and which thus includes a number of persons living on the clay at the base of the hill—a situation less favourable for health, and one which is never likely to be selected by visitors.

The official returns for the year 1892 are first given.

TABLE III.

NEW CASES OF SICKNESS COMING TO THE KNOWLEDGE OF THE MEDICAL OFFICER OF HEALTH.

	Smallpox.	Scarlatina.	Diphtheria.	Croup.	Typhus.	Typhoid.	Continued.	Puerperal.	Cholera.	Erysipelas.	Measles.	Influenza.	Remarks.
Shaftesbury 1892.	6	48	6	...	...	...	...	...	...	2	...	32	Scarlet Fever prevalent but few deaths.

The following account of the prevailing diseases is compiled from the replies to the circular letter:—

Anæmia and debility are fairly prevalent in adolescent women in shops.

Scrofula and tuberculous diseases are common; and all the ordinary manifestations occur—meningitis, peritonitis, caries and necrosis, ophthalmia, strumous glands and lupus. In this connection however, the very low infant mortality deserves notice.

Phthisis is common, and is characterised by prominence of the bronchitic element, whilst hæmoptysis appears to be comparatively rare.

Bronchitis and catarrh prevail in winter, but mostly in the population on the clay below the town proper. A similar remark may be made, relatively, respecting asthma. Pneumonia and pleurisy are not of frequent occurrence. Acute renal dropsy appears to bear some relation in its frequency to diphtheria.

Chronic albuminuria is unquestionably rather common—presumably with granular kidney. In this connection it must be mentioned that lead-poisoning from home-made wines prepared in lead-glazed earthenware (not from cider) is frequently met with during the summer. Both renal and vesical calculus is occasionally met with. Rheumatism in the general sense of the term is prevalent. Acute rheumatism is fairly common; rheumatoid arthritis is almost exclusively seen amongst the labourers on the clay. Neuralgia is by no means rare.

Facial eczema occurs frequently in winter and spring in the population below the town. Ague is unknown. Typhoid fever has been "about" for many years; and yet most of the cases appear to have been imported. Diarrhoea of a dysenteric type occasionally prevails amongst children and adults in late winter; but mostly on the south side of the hill below the town. Scarlet fever has quite recently been very rarely seen.

Diphtheria was until lately but too common. Only one death from this cause, however, had been notified to the Medical Officer of Health during the first eight months of the present year; and this case was somewhat doubtful. Endemic sore throat is also too common, but appears lately to have been almost limited in its distribution to a small number of houses drained into cesspools. Goitre occurs near, not in, the town.

Old age is very frequent. The great proportion of deaths are of persons over sixty. The common causes of death in order of relative frequency are believed to be: bronchitis, phthisis, heart disease, and apoplexy.



The death-rate ranges from 12 to 14 per thousand. For 1892 it was 14·91. The average death-rate for the ten years preceding 1892 (approximately) was :—

- (1) For Shaftesbury (population 2,212) = 16·5.
- (2) For the whole district of the Union, including Shaftesbury, = 13·2.

The following is the official report of the Medical Officer of Health of the causes of death in the urban sanitary district of Shaftesbury during 1892 :—

TABLE IV.

District.	Medical Officer.	Population.	Acreage.	Total Deaths.	Total Births.	Death Rate per 1000.	Birth Rate per 1000.	Smallpox.	Scarlatina.	Diphtheria.	Group.	Typhoid.	Puerperal.	Erysipelas.	Measles.	Whooping Cough.	Diarrhoea and Dysentery.	Rheumatic Fever.	Phthisis.	Ague.	Bronchitis, Pleurisy, and Pneumonia.	Heart Disease.	Injuries.	Cancer.	Influenza.	All other Diseases.	Totals.
Shaftesbury 1892	Dr. Sawyer	2,212	100	33 53	14 91	...	...	...	...	...	...	...	...	...	...	...	2	...	...	...	4	4	...	...	...	23 33	

**Therapeutic Effects and Uses.**—Shaftesbury is yearly being more and more frequented during the summer and autumn months. Visitors are mainly persons in search of change and relief from town life and its attendant closeness of atmosphere, crowding, bustle, heat, and narrowness and artificialness of outlook—in other words, persons in want of a bracing country holiday. Shaftesbury possesses the conditions necessary to secure this end in a remarkable and almost unique manner, as we have seen. Its bold and sudden elevation on sandstone above a vast extent of softly undulating variegated country affords a pure bracing air, a volume of light, a breadth and depth of atmosphere, and a prospect of endless variety of light and shade and colour which as a whole are probably unrivalled at any *town*—as distinguished from a mountain view—in England. The total effect is practically as open, free, and bracing as that of the sea on a calm day, and yet restful. Naturally, to those who love the country as distinguished from the coast this place offers remarkable attractions and benefits.

Another class of visitors at Shaftesbury are convalescents from

acute disease. The place possesses, as we have seen, a number of level walks, without sacrifice of freshness of air, and with but little limitation of prospect; and these are being extended, so that one or more may always be available whatever the wind. The avenue or Park within the ancient abbey gardens deserves special notice in this connection.

Lastly, a trial is being made of Shaftesbury as a hill-station or a resort for tuberculous subjects during the summer and autumn months. Strumous children sent by arrangement from Waterloo Bridge Road Hospital in London, to the Cottage Hospital in the Park, are particularly benefited, and it is the experience of the resident practitioners that scrofulous and tubercular diseases improve here. The promising suggestion has been made that Shaftesbury may provide a change for phthisical patients from the health resorts of the south coast after their long winter's residence—at Bournemouth and the Isle of Wight in particular. This idea appears to be worthy of practical development. But if this is to be carried out, and indeed if Shaftesbury is to become more popular and useful as a bracing and attractive place for change from town, better accommodation will have to be provided in the town—by the erection of more houses provided with sanitary arrangements of the most approved kind, and apart from the narrow streets in which “apartments” are now mainly to be obtained.

#### WEYMOUTH.

The part of Weymouth that calls for topographical description here consists mainly of a long crescentic esplanade built on the low level shore of a grand unbroken semilunar bay. This is the sea front of Melcombe Regis, separated from Weymouth proper by the Backwater, an expansion of the estuary of the Wey, and by the harbour which is its mouth. The harbour opens close under the lee of the high southern horn of the crescent, called the Nothe, which separates Weymouth Bay from Portland Roads.

The exposure of the new town on its sea front is due east; and the chief natural protection which it enjoys from wind and rain is on the south and south-west, as well as on the north by the more distant chalk downs.

The most striking feature of Weymouth is its entirely open



marine situation. A great semi-circular line of substantial stone-built houses, stretches for about a mile along level sands, only a few feet above the sea at high water. In this respect Weymouth contrasts strongly with certain places on the coast which boast of being protected from the more severe influences of the sea. The sands are extensive, safe, and well regulated.

**Geology and Soil.**—The geological features of Weymouth are full of interest. Most of the town stands on the middle oolite, whilst the Portland beds are in the immediate vicinity, as well as Purbeck beds and chalk in highly instructive relations. That part of the town which faces the bay is situated upon a bed of sand and shingle, some eight or ten feet in thickness, overlying Oxford clay. This bed appears to have been originally composed of sea beaches, formed upon the narrow peninsula that separates the bay from the Backwater. Rain-water rapidly percolates through this stratum, so that the subsoil is particularly dry. In the suburbs, however, the Oxford clay crops up, requiring special sanitary arrangements to carry off the surface water.

**Climatology and Meteorology.**—The climatology and meteorology of Weymouth are set forth in the following tables:—

MONTHLY MEANS FOR TEN YEARS (1881-90).

Station, WEYMOUTH, DORSET. Height above Mean Sea Level, 79 feet.

T. B. GROVES, F.R.Met.Soc., Observer.

MONTH.	TEMPERATURE OF AIR IN MONTH.			Mean Temperature of Air in Month.	Mean Relative Humidity, 9 a.m.	Amount of Sunshine.	Mean Cloud, 9 a.m.	RAIN.	
	Mean of Highest.	Mean of Lowest.	Mean Daily Range.					Days it fell.	Inches.
January ...	45·7	37·1	8·6	41·4	87	...	6·8	16	2·33
February ...	45·3	37·2	8·1	41·3	85	...	6·1	11	1·96
March ...	47·5	37·2	10·3	42·3	82	...	5·2	12	1·79
April ...	51·9	40·6	11·3	46·2	78	...	5·3	12	1·81
May ...	58·3	46·3	12·0	52·3	77	...	4·7	11	1·75
June ...	63·8	51·5	12·3	57·7	76	...	4·4	11	2·24
July ...	66·8	54·6	12·2	60·7	77	...	4·7	13	1·92
August ...	66·9	54·8	12·1	60·9	75	...	4·3	12	1·90
September ...	63·4	52·6	10·8	58·0	79	...	4·7	12	2·19
October ...	56·2	46·0	10·2	51·1	80	...	5·3	14	3·01
November ...	51·2	43·2	8·0	47·2	84	...	6·7	18	3·52
December ...	45·9	37·7	8·2	41·8	85	...	6·3	15	2·59

## MEANS FOR TEN YEARS (1881-90)—QUARTERLY AND YEARLY.

Station, WEYMOUTH, DORSET. Height above Mean Sea Level, 79 feet.

T. B. GROVES, F.R.Met.Soc., Observer.

QUARTERS AND YEAR.	TEMPERATURE OF AIR.			Mean Temperature of Air.	Mean Relative Humidity, 9 a.m.	Amount of Sunshine.	Mean Cloud, 9 a.m.	RAIN.	
	Mean of Highest.	Mean of Lowest.	Mean Daily Range.					Days it fell.	Inches.
Jan.—March ...	46.2	37.2	9.0	41.7	85	...	6.0	39	6.08
April—June ...	58.0	46.1	11.9	52.1	77	...	4.8	34	5.80
July—Sept. ...	65.7	54.0	11.7	59.9	77	...	4.6	37	6.01
Oct.—Dec. ...	51.1	42.3	8.8	46.7	83	...	6.1	47	9.12
Whole year ...	55.2	44.9	10.3	50.1	80	...	5.4	157	27.01

When we analyse these returns we obtain some results remarkably in favour of this place as a health resort.

The mean temperature for the year is  $50.1^{\circ}$ , against  $50.8^{\circ}$  at Ventnor, and  $50.6^{\circ}$  at Falmouth; a figure which is one of the eight highest in the kingdom. Mr. Pleydell Wilton finds that the average temperature of Weymouth is one degree lower than that of Bournemouth in the summer, and one degree higher in the winter; and this statement is confirmed by a comparison of the figures contained in the present report.

The mean temperature at 9 a.m. for the six winter months, October to March inclusive, is  $44.33^{\circ}$ , as compared with  $43.7^{\circ}$  at Bournemouth and  $41.066^{\circ}$  at Regent's Park.

The mean temperature at 9 a.m. for the six summer months, April to September inclusive, is  $56.55^{\circ}$ , as compared with  $59.1^{\circ}$  at Bournemouth and  $56.65^{\circ}$  at Regent's Park.

The mean relative humidity at 9 a.m. is but 80: as low as that at Brighton, the second lowest on the south coast, exceeding by 2.3 degrees that of Bournemouth, which is the lowest in the kingdom.

The mean amount of cloud is only 5.4, the lowest recorded in the kingdom.

The mean rainfall for the year is 27.01 inches—fully one inch less than at Ventnor.

The number of rainy days is not more than 157, the same as at Worthing, and better than at any other station in the country, excepting Swarraton in Hampshire, and Bude.



**Drainage.**—The system of drainage is not considered to be satisfactory, and is at present occupying the attention of the authorities. The sewage is discharged into the Backwater and the harbour. The ebb is believed to drain and ventilate the sewers, and to carry the sewage out to sea; but the flow of the tide blocks the sewers and dilutes the sewage as the water rises.

The water supply is excellent as regards abundance, constancy, and purity. It is obtained from the greensand underlying the chalk downs some four miles distant, with a pressure which carries it to the top of the highest house in Weymouth. It is very hard.

**Prevailing Diseases.**—Anæmia and debility are common amongst young women, but readily yield to treatment. Scrofula and tuberculous diseases, excluding phthisis, are uncommon or even rare. Phthisis also is uncommon, the death-rate from this disease in 1890 being only 0·8 per thousand. According to the annual report of the Weymouth Royal Hospital for 1890, the deaths from phthisis in the borough in 1889 and 1890, were 15 and 13 respectively, instead of 25, the general average for the kingdom (1·74 per thousand); and of the 1,454 out-patients treated during 1889, only 10 suffered from consumption. Hæmoptysis is said to be rare. On the other hand, bronchitis is common and general, especially from autumn to spring. Pneumonia is comparatively rare, except in very young children; pleurisy is rare. Asthma would appear to be of ordinary frequency. Acute renal dropsy is not common, but chronic albuminuria associated with granular kidney is rather frequent. Calculus is almost unknown in Weymouth; gravel occurs now and then. Acute rheumatism is not often seen; but what is called subacute rheumatism and neuralgia may prevail along with catarrh. Rheumatoid arthritis is probably of less than average frequency. In the experience of some of the local practitioners eczema is not very frequent; of others, rather prevalent but amenable to treatment; of one observer, common and obstinate. Malarial affections are practically unknown. Typhoid fever is much less common than formerly; indeed is becoming rare since the town was drained. The same remark applies to diarrhoea, which is here chiefly a disease of the autumn. Scarlet fever is only occasionally met with. True diphtheria also appears to be uncommon; but follicular tonsillitis and quinsy frequently call for treatment.

The report for 1892 of the Medical Officer of Health of the urban district of Weymouth, gives the following as the new cases of sickness coming to his knowledge during this period:—

TABLE I.

NEW CASES OF INFECTIOUS SICKNESS COMING TO THE KNOWLEDGE OF THE  
MEDICAL OFFICER OF HEALTH.

	Smallpox.	Scarlatina.	Diphtheria.	Croup.	Typhus.	Typhoid.	Continued.	Puerperal.	Cholera.	Erysipelas.	Measles.	Influenza.	Remarks.
Weymouth	...	33	5	1	...	5	...	3	...	5	...	...	Scarlet fever prevalent.

The common causes of death at Weymouth are diseases of the respiratory organs, particularly bronchitis, and diseases of the heart and circulation. Dr. Moorhead, senior physician to the Weymouth Royal Hospital, sends the following very valuable statistical note on this subject: During the seven years ending December 31, 1892, 115 deaths were certified by him. Of these 36 were caused by diseases of the respiratory organs, including bronchitis, pneumonia, pleurisy and phthisis, the latter being represented by 8 only, or about  $\frac{1}{14}$  of the whole mortality, the normal average of the kingdom being about  $\frac{1}{11}$ . Twenty-two deaths were due to diseases of the circulatory system, chiefly of the heart; 28 to congestion and softening of the brain; 5 to chronic Bright's disease; 6 to rheumatism and gout; 5 to cancer; 5 to diarrhoea in children; and 2 to diabetes.

As regards the frequency of old age, the experience of two of the local observers may be thus represented: (1) Total number of deaths, 115; between 70 and 80 years, 26; between 80 and 90, 19; over 90, 2. Maximum age, 93. (2) Total number of deaths, 113; between 70 and 80 years, 40; between 80 and 94, 19.

The official report of the Medical Officer of Health gives the death-rate for the year 1892 as 14·382; in children 3·667; the infant mortality 114 per 1,000 births; and the zymotic death rate 1·43. The causes of death were as follows:—





suited to different tastes, as well as bands and a theatre in the season. Steamboats ply between Weymouth and the neighbouring parts of the coast in the summer; and there is a service of mail steamers to and from the Channel Islands.

The Committee gratefully acknowledges the help rendered by Drs. Carter, Griffin, Lush, Moorhead, and Wilton, in preparing this account of Weymouth.

#### SWANAGE.

Swanage is a small place lying close within the southern horn of a beautiful bay in the eastern extremity of the Isle of Purbeck. The exposure of the bay is due east. The greater part of the shore retains its natural characters—a fine strip of beach backed by low cliffs of sand and clay. The northern horn of the bay is formed by a bold and brilliantly conspicuous cliff of chalk—Ballard Point. This represents the abrupt abutment on the sea of the narrow chalk down which runs continuously through the Isle of Purbeck from the direction of Dorchester, bounding Poole Harbour on the south, and constituting part of the Purbeck Hills.

The southern horn of Swanage Bay, Peverel Point, lies immediately at the back of the town. It is a great reef of the Purbeck beds, running obliquely into the depths of the sea like a plough-share, and turning up a great furrow of dangerous-looking broken water which can be traced well out from the land. Behind the bay, landwards, to the west, is a series of downs and low cultivated elevations, spurs of the Purbeck Hills. Swanage is thus "land-locked from every breeze": it enjoys shelter from the three land quarters—north, south and west.

Seawards, to the east, the prospect and all the character of the place are thoroughly marine. The water is of a brilliant blue; and across the bay to the north-east and east are views of the coast by Bournemouth and Christchurch and of the Needles in the farther distance. Trees flourish in abundance, especially in the warmer and more sheltered parts to the south of the town; and as Kingsley wrote, "the gayest and tenderest garden flowers bask under the hot stone walls."



**Geology.**—Swanage is one of the points in the Isle of Purbeck at which the remarkably complete series of geological formations of this district, and the special beds which derive their name from it, can be very easily studied. The south horn of the bay and the hill with which it is continuous, close behind the town, are formed by the limestone rocks of Purbeck stone and Purbeck marble belonging to the oolite period. The cliffs of the bay itself are wealden. The northern horn of chalk, with a thin fringe of greensand, stands out against the distant Needles, with which it is no doubt geologically associated. If we were to travel northwards on the island over the narrow ridge of the chalk down towards the south shore of Poole Harbour, we should finally pass on to the London clays and Bagshot sands and clays of the eocene.

**Climate and Meteorology.**—It has been found impossible to obtain continuous records of meteorological observations at Swanage for late years. Appended are a few partial records taken from *Swanage (Isle of Purbeck)*, an important work on the place in all its relations, which is edited by Mr. John Braye, and to which Dr. Forbes Winslow contributes the section on "Swanage as a Health Resort." Drs. Delamotte and McCausland have also contributed valuable information on this subject and others.

TABLE I.  
SHOWING THE RAINFALL IN INCHES IN THE DIFFERENT MONTHS IN  
1887, 1888, 1889.

	1887.	1888.	1889.
January . . . . .	2·86	1·60	0·85
February . . . . .	0·88	0·94	1·54
March . . . . .	0·86	3·35	2·12
April . . . . .	0·65	1·26	1·82
May . . . . .	1·91	1·91	1·31
June . . . . .	0·93	2·39	0·66
July . . . . .	0·65	3·01	2·00
August . . . . .	2·37	2·07	2·53
September . . . . .	3·49	1·78	0·51
October . . . . .	2·02	2·35	6·31
November . . . . .	3·52	5·91	1·39
December . . . . .	2·21	1·97	2·51
Inches . . . . .	22·25	28·54	23·55

TABLE II.

SHOWING CERTAIN OTHER IMPORTANT METEOROLOGICAL OBSERVATIONS  
FOR THE YEARS 1881 AND 1882.

SWANAGE.	1881.	1882.
Mean Temperature . . . . .	48·8	50·0
Mean Night Temperature . . . . .	43·8	45·3
Mean Daily Range . . . . .	10·0	9·4
Actual Minimum Temperature . . .	12·7*	22·5
Actual Maximum Temperature . . .	81·7	71·9

\* Year of the great frost.

Amount of sunshine, 41 per cent. Fogs are very rare. The prevailing winds are westerly.

**Drainage.**—There is no complete system of drainage, and the matter is at present (1893) under the consideration of the County Council.

The water supply is good, from the chalk and limestone.

**Prevalence of Diseases.**—Anæmia and debility are seldom seen at Swanage. Scrofula and tuberculosis, including phthisis, are rare. Bronchitis and catarrh are not very prevalent in winter; and pneumonia, pleurisy and asthma are all uncommon. Acute renal dropsy is not at all frequent, but chronic albuminuria is occasionally met with. Gravel and calculus are very rare. Rheumatism, rheumatoid arthritis and neuralgia are infrequent. A few cases of eczema occur, but are not severe. With respect to endemic diseases, malaria is unknown, typhoid fever is very rare, diarrhoea occurs occasionally, scarlet fever is generally imported, diphtheria is seldom seen, and endemic sore throat is not recognised.

The common causes of death cannot be particularised, no kind or class of disease proving specially fatal. In 1892 the death-rate was 19·5, an unusually high figure for Swanage, and mainly referable to a severe epidemic of whooping cough. The following is the official return for that year:—



District.	Medical Officer.	Population.	Acreage.	Total Deaths.	Total Births.	Death Rate per 1000.	Birth Rate per 1000.	Smallpox.	Scarlatina.	Diphtheria.	Croup.	Typhoid.	Puerperal.	Erysipelas.	Measles.	Whooping Cough.	Diarrhoea and Dysentery.	Rheumatic Fever.	Phthisis.	Ague.	Bronchitis, Pleurisy, Pneumonia.	Heart Disease.	Injuries.	Cancer.	Influenza.	All other Diseases.	Total.
Swanage 1892.	Dr. McCausland.	2,668	...	52	75	19.5	...	...	1	...	...	...	...	...	...	10	...	...	3	...	5	4	4	...	...	25.52	

Old age is very frequently attained, many of the people living to over eighty.

**Therapeutic Effects and Uses.**—The value of Swanage as a health resort is well understood. It is filled with visitors in summer who come to enjoy its bright, bracing, cool climate, its primitive appearance, and the attractions of its beautiful and still natural surroundings.

It is simply a quiet little place for rest and change in the hot summer months. Bathing is provided for on the beach. Within a few minutes' walk of the town are almost endless sources of interest to the amateur geologist. Immediately to the south, in Durlston Bay, are majestic limestone cliffs, with spacious caves which can be easily explored. The walls by the paths are built of highly fossiliferous stone. In the hill above are the workings of Purbeck marble quarries. For the antiquary a place of much interest is Corfe Castle, which lies but a few miles inland on the line to Wareham. Swanage also possesses an excellent pier, from which there is a fine view of the Needles. Swanage is visited daily in the season by steamers from the neighbouring places on the coast, and is in this way perhaps most widely known as one of the places of call of the Bournemouth steamers in their invigorating sea-trips.

## THE CLIMATE OF HAMPSHIRE

By J. MITCHELL BRUCE, M.D., F.R.C.P.

HAMPSHIRE is so extensive, and so diverse in its physical features, geological formation, soil, vegetation, relation to the sea, meteorology and climate generally, that any description of it as a whole would be of little practical value in connection with the present inquiry. It may be said with more advantage to comprise four districts, corresponding with different geological formations:—(I.) the middle district, on the chalk; (II.) the south-western and southern district, consisting of the New Forest and the broken coast region from Southampton to Havant, on upper, middle and lower eocene formations; (III.) the north-east corner, wedged in between Berkshire and Surrey, on the Bagshot sands and London clay; and (IV.) a comparatively small area on the eastern border, extending from Farnham in the north to Petersfield in the south, and belonging to the older formations of the upper and lower greensands.

### I. THE MIDDLE DISTRICT.

The chalk occupies about one half of the area of Hampshire. It enters the county along the northern half of its western border, out of South-East Wiltshire; runs obliquely south-east in the form of a great rectangle about twenty-five miles in breadth; and passes out of the county—into Surrey in the north, at the western extremity of the Hog's Back, as the North Downs, and into Sussex in the south, as the South Downs, extending from Petersfield to the coast.

A little to the south and west of the middle of this district lies Winchester, the White City, or City of the Chalk.

This district presents the familiar characters of the chalk. It



consists mainly of long rolling downs, mostly cultivated, except in the extreme north, and comparatively bare of trees. The highest point is Sidon Hill, 940 feet, near Highclere.

This area is drained mainly southward into Southampton Water by the Itchen and the Anton or Test. Protection from wind and rain is necessarily but poor.

**Meteorology.**—It will suffice to give the meteorological returns from the two stations of the Royal Meteorological Society in this district, Swarraton and Harestock.

#### MONTHLY MEANS FOR TEN YEARS, 1881-90.

Station, SWARRATON, ALRESFORD, HANTS. Height above Mean Sea Level, 310 feet.

Rev. W. L. W. EYEE, M.A., F.R.Met.Soc., Observer.

MONTH.	TEMPERATURE OF AIR IN MONTH.			Mean Tempera- ture of Air in Month.	Mean Relative Humidity, 9 a.m.	Amount of Sunshine.	Mean Cloud, 9 a.m.	RAIN.	
	Mean of Highest.	Mean of Lowest.	Mean Daily Range.					Days it fell.	Inches.
	°	°	°	°	%	<sup>1</sup> hrs.			
January ..	42.5	32.0	10.5	37.3	No Record.	...	7.6	15	2.61
February ...	43.8	33.2	10.6	38.5		...	7.7	11	2.28
March ...	47.2	32.8	14.4	40.0		...	6.8	11	2.12
April ...	53.3	36.4	16.9	44.9		...	7.1	12	1.89
May ...	60.5	42.0	18.5	51.3		...	6.8	12	2.23
June ...	65.7	47.5	18.2	56.6		...	7.0	11	1.95
July ...	68.3	50.9	17.4	59.6		...	6.8	14	2.75
August ...	67.8	49.8	18.0	58.8		...	6.2	13	2.46
September ...	63.2	47.1	16.1	55.2		...	6.7	12	2.42
October ...	54.6	40.0	14.6	47.3		...	6.8	15	2.82
November ...	48.7	37.3	11.4	43.0		...	7.3	15	3.24
December ...	42.4	32.1	10.3	37.3		...	7.6	15	2.47

Station, HARESTOCK, WINCHESTER, HANTS. Height above Mean Sea Level, 300 feet.

Lieut.-Col. H. S. KNIGHT, F.R.Met.Soc., Observer.

January ...	42.6	32.8	9.8	37.7	90	45	7.7	16	2.92
February ...	44.1	33.5	10.6	38.8	88	69	7.8	13	2.15
March ...	47.6	33.1	14.5	40.3	81	121	6.8	13	2.19
April ...	53.5	36.8	16.7	45.2	76	151	7.3	13	1.98
May ...	60.3	42.5	17.8	51.4	72	198	6.8	14	2.13
June ...	66.0	48.1	17.9	57.1	72	190	6.9	11	2.11
July ...	68.5	51.3	17.2	59.9	73	180	7.0	15	2.46
August ...	68.1	50.7	17.4	59.4	73	200	6.6	14	2.32
September ...	63.7	47.9	15.8	55.8	81	144	6.9	12	2.40
October ...	55.1	40.9	14.2	48.0	85	105	6.8	16	2.96
November ...	49.1	37.9	11.2	43.5	88	56	7.4	17	3.40
December ...	42.8	32.9	9.9	37.9	89	45	7.6	16	2.72

<sup>1</sup> The sunshine observations are for the nine years, 1882-90.

## MEANS FOR TEN YEARS, 1881-90.—QUARTERLY AND YEARLY.

Station, SWARRATON, ALRESFORD, HANTS. Height above Mean Sea Level, 310 feet.

Rev. W. L. W. EYRE, M.A., F.R.Met.Soc., Observer.

QUARTERS AND YEAR.	TEMPERATURE OF AIR.			Mean Temperature of Air.	Mean Relative Humidity 9 a.m.	Amount of Sunshine.	Mean Cloud, 9 a.m.	RAIN.	
	Mean of Highest.	Mean of Lowest.	Mean Daily Range.					Days it fell.	Inches.
Jan.—March ...	44·5	32·7	11·8	38·6	%	hrs.	7·4	37	7·01
April—June ...	59·8	42·0	17·8	50·9	No record.	...	7·0	35	6·07
July—Sept. ...	66·4	49·3	17·1	57·9	...	...	6·6	39	7·63
Oct.—Dec. ...	48·6	36·5	12·1	42·5	...	...	7·2	45	8·53
Whole year ...	54·8	40·1	14·7	47·5	...	...	7·0	156	29·24

Station, HARESTOCK, WINCHESTER, HANTS. Height above Mean Sea Level, 300 ft.

Lieut.-Col. H. S. KNIGHT, F.R.Met.Soc., Observer.

Jan.—March ...	44·8	33·1	11·7	38·9	86	1235	7·4	42	7·26
April—June ...	59·9	42·5	17·4	51·2	73	539	7·0	38	6·22
July—Sept. ...	66·8	50·0	16·8	58·4	76	524	6·8	41	7·18
Oct.—Dec. ...	49·0	37·2	11·8	43·1	87	206	7·3	49	9·08
Whole year ...	55·1	40·7	14·4	47·9	81	1504	7·1	170	29·74

<sup>1</sup> The sunshine observations are for the nine years, 1882—90.**Drainage, Water Supply, and Prevailing Diseases.—**

Certain important facts illustrating these subjects will be gathered from the table on the following page furnished for the purpose of illustrating this report, in the spring of 1893, by Mr. Wellesley Harris, D.P.H., Medical Officer of Health to the Borough and Port of Southampton.

The mortality and morbidity returns of this district are more fully set forth in Tables I. and II. on pages 157, 158.

**Therapeutic Effects and Uses.**—No part of the middle district of Hants, healthy though it be, can claim to be of special value as a health resort. Its therapeutic effects, therefore, do not call for consideration by us.



Town or District.	Zymotic Death Rate.	No. of cases of Diphtheria notified last two years.	No. of cases of Typhoid Fever notified last two years.	Water Supply.		Soil.	System of Drainage in Use.
				How obtained.	Characters.		
Alton ... (Urban.)	Nil.	2	2	It is obtained by sinking down and pumping up a supply for the town. The well extends many feet into the chalk stratum with a bottom of green sand. It was hoped to have bored into the latter but this was impracticable.	The water is abundant and of good quality but is rather (as might be expected), too hard.	The pre-dominant strata are those before mentioned.	The drainage is undergoing trial, or rather the treatment of the sewage is on trial. They have the water-closet system of drainage, and at present the sewage is treated first by the ferri-alumina process and afterwards it is passed over beds of carbon to filter through, the carbon being prepared from carbonising the rubbish, &c., of the town on the spot. Sometimes the effluent is good, and at times is indifferent, and no doubt eventually the land treatment will be resorted to, although expensive for the town.
Alton ... (Rural.)	1.43	2	5	Iron wells and tanks.	Good.	(Not given.)	No system of drainage.
Stock-bridge... (Rural.)	0.91	21	None.	From sunk wells and from the chalk.	Very hard.	Light soil. Chalk.	Cesspools.
Alresford ....	0.45	12	2	Deep well in chalk.	20 grains to one gallon solids; 10° permanent hardness—3° temporary hardness.		No system of drainage.
Whitchurch...		3	1	Wells of various kinds.	Fairly good as a rule.	Chiefly Chalk.	None.







## II. THE SOUTH-WESTERN AND SOUTHERN DISTRICT.

This district comprises the New Forest, and the South Coast from Southampton to Havant.

**General Physical Characters.**—This is a low, irregularly undulating, woodland, littoral country, possessing as a whole little natural protection from winds. Its geological formation belongs to the upper, middle, and lower eocene—particularly the middle eocene. Most of the parts of this district of interest to the climatologist consist of sand and gravel many feet in thickness, lying (in some places at least) on blue clay, and this again on the chalk. The soil appears to consist of a comparatively recent fluvio-marine deposit belonging to the estuary of a large river flowing from west to east, now represented only by the Frome, falling into Poole Harbour; and it may be mentioned in this connection that the district we are now considering corresponds geologically with the northern half of the Isle of Wight, the Solent being at that early period part of the great river valley.

This district is drained by a number of small rivers running due south into the Channel, namely the Stour and Avon in the west, the Lymington and Beaulieu rivers in the New Forest, and the Test, Itchen, Hamble, and other smaller streams falling into Southampton Water.

It presents no elevation of importance, the highest point in the New Forest being Stoney Cross.

Protection from wind and rain is only such as is afforded by the abundant and extensive forest growth.

(A) **The New Forest.**—The greater part of this district, extending over some 53,000 acres, is occupied by the New Forest, which is the principal natural feature of the south of Hampshire.

Much of the Royal Forest is truly sylvan in character, being closely wooded with oak, beech, pine and a variety of other trees. In some places the bare heath prevails, with straggling groups and clumps of pines and gorse, and broken banks and pits, which expose the brilliant white shingle and sand from which the coarse vegetation springs. Here and there in the hollows run the



little affluent streams of the Lymington and Beaulieu rivers which drain the forest, and of the Avon and the Test which bound it on the west and east respectively. These streams are fringed in places by bits of meadowland, which, with occasional farms, parks, villages, hamlets, and single cottages, and the roads that run between them, interrupt the continuity of the forest, and give a feeling of variety, cheerfulness and life to a scene that might otherwise be monotonous or even depressing by its extent and stillness.

On the borders of the forest the bent of the trees and boughs indicates the prevalence and the strength of south-west winds, and the amount of protection which must be afforded within it.

(B) *The Narrow Western Part* of the district extending from the Avon to the Dorset border is far more open: consisting of culture and pasture land along the river valley; of rough level heath, studded with pines and gorse along the coast, where its natural characters are now in many places rapidly disappearing in the presence of the growing towns of Bournemouth, and Southbourne.

(C) *The Eastern Part* of the district, from Southampton to Portsmouth, possesses the ordinary open sylvan character of English scenery; but no doubt it enjoys special protection from the prevalent winds—from the south-west winds by the great screen of the New Forest, and from the north-east winds by the Portsdown Hills.

*The Coast.*—The coast of Hampshire presents widely different features in its eastern and western portions.

From Havant to Hurst Castle it is low, and broken by the estuaries of various streams, where large tracts of mud and sand are exposed at low water.

The western half of the coast line, on the contrary, possesses bold sandy cliffs, broken only by the mouth of the Avon and Stour and by many chines which run up into the pine-covered heath-land behind.

The influence of the Gulf Stream is said to be felt even in the Solent. Deflected from the coast farther west, it rounds the Isle of Wight from west to east along the Undercliff, and returns by Spithead and the Solent from east to west, washing the shores of Christchurch Bay, which have thus four tides every twenty-four hours.

**Climate and Meteorology.**—The following tables present the climatology of Southampton and Portsmouth during the ten years, 1881–1890. Those relating to Southbourne are given at page 195:—

## MONTHLY MEANS FOR TEN YEARS (1881-90).

Station, SOUTHAMPTON (HIGHFIELD), HANTS. Height above Mean Sea Level,  
136 feet.

Rev. H. GARRETT, M.A., F.R.Met.Soc., Observer.

MONTH.	TEMPERATURE OF AIR IN MONTH.			Mean Tempera- ture of Air in Month.	Mean Relative Humidity, 9 a.m.	Amount of Sunshine.	Mean Cloud, 9 a.m.	RAIN.	
	Mean of Highest.	Mean of Lowest.	Mean Daily Range.					Days it fell.	Inches.
January ...	43·9	32·6	11·3	38·3	92	146	7·3	18	2·67
February ...	45·4	33·9	11·5	39·7	88	67	7·5	14	2·09
March ...	49·0	33·5	15·5	41·2	82	126	6·5	15	2·03
April ...	55·2	37·3	17·9	46·2	75	163	6·8	14	1·96
May ...	62·2	43·1	19·1	52·6	72	211	6·4	13	2·22
June ...	67·9	48·4	19·5	58·2	72	204	6·7	12	1·82
July ...	69·9	51·6	18·3	60·7	73	207	6·9	17	2·64
August ...	69·5	50·6	18·9	60·1	74	203	6·3	15	2·19
September ...	65·1	48·1	17·0	56·6	82	150	6·7	15	2·44
October ...	56·5	40·9	15·6	48·7	85	112	6·3	17	3·04
November ...	50·2	38·0	12·2	44·1	90	57	7·3	19	3·45
December ...	43·8	32·9	10·9	38·4	90	46	7·2	18	2·67

Station, PORTSMOUTH, HANTS. Height above Mean Sea Level, 20 and 18 feet.

R. E. POWER, L.R.C.P., and B. H. MUMBY, M.D., Observers.

January ...	44·4	33·8	10·6	39·1	91	...	7·1	17	2·33
February ...	45·4	34·9	10·5	40·2	89	...	6·7	13	1·92
March ...	48·8	35·1	13·7	41·9	84	...	5·5	13	1·69
April ...	54·6	38·8	15·8	46·7	78	...	5·6	14	1·63
May ...	62·2	45·3	16·9	53·7	75	...	5·3	12	1·90
June ...	68·0	50·4	17·6	59·2	75	...	5·4	11	1·74
July ...	70·7	53·7	17·0	62·2	75	...	5·7	15	2·34
August ...	70·4	53·7	16·7	62·1	77	...	5·0	14	1·94
September ...	66·1	50·8	15·3	58·4	82	...	5·5	14	2·33
October ..	57·6	43·7	13·9	50·6	86	...	5·7	15	2·90
November ...	51·1	40·6	10·5	45·9	90	...	6·8	18	3·19
December ...	44·6	35·2	9·4	39·9	90	...	7·1	17	2·12

<sup>1</sup> The sunshine observations were made at the Ordnance Survey Office, in the town of Southampton.



## MEANS FOR TEN YEARS, 1881-90.—QUARTERLY AND YEARLY.

Station, SOUTHAMPTON (HIGHFIELD), HANTS. Height above Mean Sea Level, 136 ft.

Rev. H. GARRETT, M.A., F.R.Met.Soc., Observer.

QUARTER AND YEAR.	TEMPERATURE IN AIR.			Mean Temperature of Air.	Mean Relative Humidity, 9 a.m.	Amount of Sunshine.	Mean Cloud, 9 a.m.	RAIN.	
	Mean of Highest.	Mean of Lowest.	Mean Daily Range.					Days it fell.	Inches.
Jan.—March ...	46.1	33.3	12.8	39.7	87	<sup>1</sup> 239	7.1	47	6.79
April—June ...	61.8	42.9	18.9	52.3	73	578	6.6	39	6.00
July—Sept. ...	68.2	50.1	18.1	59.1	76	560	6.6	47	7.27
Oct.—Dec. ...	50.2	37.3	12.9	43.7	88	215	6.9	54	9.16
Whole year ...	56.6	40.9	15.7	48.7	81	1592	6.8	187	29.22

Station, PORTSMOUTH, HANTS. Height above Mean Sea Level, 20 feet, 18 feet.

R. E. POWER, L.R.C.P., B. H. Mumby, M.D., Observers.

Jan.—March ...	46.2	34.6	11.6	40.4	88	...	6.4	43	5.94
April—June ...	61.6	44.8	16.8	53.2	76	...	5.4	37	5.27
July—Sept. ...	69.1	52.7	16.4	60.9	78	...	5.4	43	6.61
Oct.—Dec. ...	51.1	39.8	11.3	45.5	89	...	6.5	50	8.21
Whole year ...	57.0	43.0	14.0	50.0	83	...	6.0	173	26.03

<sup>1</sup> The sunshine observations are for the nine years, 1882—1890.

When these figures are analysed and compared with each other and with those belonging to certain familiar places in England, they yield results of considerable interest.

*First, with respect to Temperature.*—(1) Southbourne possesses the most equable mean temperature of the three stations in the district, having the highest mean minimum temperature, the lowest mean maximum temperature; and a mean temperature between the mean temperatures of the two other towns.

(2) Portsmouth presents the highest mean temperature, and the highest mean maximum temperature.

(3) Southampton presents the lowest mean temperature, and the lowest mean minimum temperature by more than 2°.

(4) On the whole, the mean temperature, for ten years, of this region, i.e. of the three coast stations, 49.3°, is exactly the same as that of Ramsgate; and is within 10° of the mean temperature of London—Norwood and Regent's Park. It is important, however,

to note, in connection with the present inquiry, that if we take the five winter months by themselves, November, December, January, February and March, we find that in each and all of these the temperature of Southbourne is perceptibly higher than that of Ramsgate; whilst in the remaining seven months of the year the relation is reversed.

*Secondly, the Humidity.*—The mean relative humidities may be compared as follows: Southampton 81, the same as that of Regent's Park; Southbourne 82, which corresponds with that of Margate, Ramsgate, and Falmouth; and Portsmouth 83, the same as the humidity of Scarborough, Lowestoft and Worthing.

*Thirdly, the Sky.*—Judged by the mean amount of cloud at 9 a.m., Southbourne and Portsmouth are two of the brightest places in the whole of England, being equal in this respect to Ventnor, and only Weymouth and Worthing presenting less cloud. Southampton is scarcely less bright, rivalling Margate, Ramsgate and Norwood.

*Fourthly, Rainfall.*—The returns from the three stations indicate that the region of the New Forest and South of Hampshire is moderately dry. At Southbourne and Portsmouth about one inch more rain falls annually than at Regent's Park; and at Southbourne the number of rainy days is decidedly small—160. At Southampton more rain falls, amounting to 29·22 inches, which is practically the same as at Harestock and Swarraton on the chalk downs behind it. The number of rainy days correspond, being as many as 187.

It will thus be seen that the south of Hampshire occupies a place in the rainfall table intermediate between the south-east stations, such as Margate (23·31 in.), and the south-west stations, such as Babbacombe (33·89 in.). At the same time it deserves to be mentioned that in July, August, September and October, Southbourne has even less rain than Ramsgate, whether estimated by inches or by the number of rainy days. It must also be remembered in connection with the rainfall of this district that the soil is extremely absorbent, the surface drying rapidly after a shower.

According to "a return to Government some ten or fifteen years ago," quoted by Scott,<sup>1</sup> the annual number of fogs at Hurst Castle

<sup>1</sup> "Notes on the Climate of the British Isles," *Longman's Magazine*, June 1892.



is thirteen as compared with thirty-four on the east coast (Yarmouth) and twenty-four in London.

**Prevailing Winds.**—Taking the annual mean for the six obtainable years 1880-1885 inclusive, the prevailing wind at Southampton is the south-west (195); somewhat less frequent is the north-east wind (140); decidedly less frequent the north-west wind (107). From other quarters it blows much less frequently, as will be gathered from the following table:—

PREVAILING WIND AT SOUTHAMPTON, 1880-1885.

	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Calm.
1880	37	199	34	54	32	188	75	87	26
1881	41	139	39	65	43	197	65	107	34
1882	35	106	31	67	46	222	77	106	40
1883	51	112	17	68	54	174	80	136	38
1884	39	146	28	59	50	207	70	109	24
1885	51	142	39	74	43	184	55	97	45
Total .....	254	844	188	387	268	1172	422	642	207
Annual Mean..	42½	140⅔	31⅓	64½	44⅔	195½	70½	107	34½

PREVAILING WIND AT SOUTHBOURNE, 1880-1887.

	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Calm.
1880	85	134	80	44	37	106	130	183	33
1881	88	95	51	56	39	113	120	125	43
1882	77	62	45	49	54	131	147	122	43
1883	97	67	19	56	59	114	107	122	89
1884	98	95	41	37	45	149	99	97	71
1885	94	113	46	29	39	134	96	93	86
1886	110	113	49	34	27	146	90	119	42
1887	129	139	10	27	38	130	107	136	14
Total .....	778	818	341	332	338	1023	896	897	421
Annual Mean..	97¼	102¼	42⅝	41½	42¼	127⅞	112	112¼	52⅝

At Southbourne the figures (obtained for eight years 1880—1887) are somewhat different, but the south-west wind is still the

most prevalent of all (127); the north-west (112), west (112), north-east (102), and north (97) following, however, more closely on it, as indicated in the appended table.

**Drainage and Water Supply and Prevalence of Disease.**

—These points are illustrated in the tables by Dr. Wellesley Harris (see page 166).

The mortality and morbidity returns will be found in more detail in Tables III. and IV., pages 167 and 168.

**Therapeutic Effects and Uses.**—In the New Forest and South of Hampshire we possess a bright, moderately dry, equable, and—for these islands—mild climate; a very light, porous, dry soil; and the influence of the sea. These favourable features would of themselves serve to make this district of value as a health resort. But there are peculiar advantages which the New Forest presents in addition to these, and of a different order. It affords a retreat of the most complete kind; for though much frequented in summer, it is so extensive that it never loses its atmosphere of freedom, quiet and retirement. Its scenery is of great beauty, presenting all our noblest forest trees in endless variety of form, foliage and grouping—as wood, glade and thicket, with occasional glimpses of the sea, and distant views of the Isle of Wight on the southern horizon. The artist, the entomologist, the botanist and the angler find here uncommon opportunities for their favourite pursuits. Within a few minutes of Brockenhurst is Lymington, where a steamer can be taken to Yarmouth, for Freshwater and Alum Bay, in the Isle of Wight. Equally accessible from the east part of the Forest is Southampton, whence short excursions may be made in all directions along the coast. Towards the west, and within easy reach by rail, are many places of great interest: Dorchester, Wareham, Wimborne, Corfe Castle, Purbeck, Swanage, Poole Harbour and Bournemouth. Bournemouth, Southbourne, Southsea, and Milford, as special health-resorts, are considered separately.

With attractions and advantages such as these, the therapeutic uses of the New Forest are readily indicated. It is peculiarly adapted as a health resort in convalescence from acute disease; as a retreat in certain nervous diseases and some forms of neurasthenia; as a place for a quiet holiday in early spring and summer for the town-dweller, especially such as can occupy himself with



Town or District.	Zymotic Death Rate.	No. of cases of Diphtheria notified last two years.	No. of cases of Typhoid Fever notified last two years.	Water Supply.		Soil.	System of Drainage in use.
				How obtained.	Characters		
Portsmouth.	1·89	263	595	From springs.	A water from chalk, organically pure.	One half of town on London clay & one half on the Bracklesham beds of the Bagshot sands.	Into the sea.
Gosport and Alverstoke.	0·74	55	54	Gosport Waterworks Co.	Good.	Gravel.	Surface drainage and cesspools.
Romsey— Urban	0·46	6	3	Well water. (South Hants Waterworks Co.)	Fairly good. Almost pure.	Urban: 7 to 13 ft. loose gravel in upper part of town. Deep peat towards river slope.	The old drains of no great depth, emptying directly into river Test. Some drainage in dead wells still.
Rural	0·30	0	3			Rural: Gravel, sand, clay, and chalk.	
Fording-bridge.	1·2	33	1 (doubtful)	Wells and springs, some streams and river.	Hard, not good.	Principally gravel. Chalk near the down. A little clay.	Cesspools.
Ringwood.	About 2 per 1,000	About 100	4	From wells.	Somewhat hard.	Gravel and sand.	Main drain for surface water, kitchen sinks, bath water, &c. Cesspool for sewage.





TABLE IV.

TABLE OF POPULATION AND OF NEW CASES OF INFECTIOUS SICKNESS COMING TO THE KNOWLEDGE OF THE MEDICAL OFFICERS OF HEALTH FOR THE *Second District* DURING THE YEAR 1891, CLASSIFIED ACCORDING TO DISEASES, AGES, AND LOCALITIES.

SANITARY DISTRICTS.	Population, Census 1891.	Aged under 5 or over 5.	NEW CASES OF SICKNESS IN EACH LOCALITY COMING TO THE KNOWLEDGE OF THE MEDICAL OFFICER OF HEALTH.													NO. OF SUCH CASES REMOVED FROM THEIR HOMES IN THE SEVERAL LOCALITIES FOR TREATMENT IN ISOLATION HOSPITALS.													Totals.	Whether notification of Infectious Disease is compulsory in the District.	To where Removed.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
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			Smallpox.	Scarlatina.	Diphtheria.	Membranous Group.	Typhus.	Enteric or Typhoid.	Continued.	Relapsing.	Puerperal.	Cholera.	Krysipelas.	Measles.	Influenza.	Whoop, Cough.	Mumps.	Various.	Smallpox.	Scarlatina.	Diphtheria.	Membranous Group.	Typhus.	Enteric or Typhoid.	Continued.	Relapsing.	Puerperal.	Cholera.				Krysipelas.	Measles.	Tonsillitis.	Reported.	Removed.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
Christchurch Rural	12573	{ Under 5 5 upwards	6 20	8 16	1	1	6	1	1	3	3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...</

any of the pleasing pursuits already named. In the late autumn, notwithstanding the gorgeous tints of the foliage and bracken, it cannot be recommended to the invalid, in consequence of the quantity of decaying vegetable matter and the growth of fungi within it.

### III. THE THIRD DISTRICT.

The north-east corner of Hampshire lies on Bagshot sands and London clay, and belongs to the physiographical system of the Thames Valley.

As far as it concerns us in our present inquiry, this district consists of tracts of forest, common-lands and wild heath, varied as these are with parks, cultivated fields and natural pastures. The surface is generally level, diversified in places with sharp elevations of considerable height. It is drained entirely northwards into the Thames by the Lodden, the Whitewater and the Blackwater. The pine flourishes here in great abundance, affording local protection and characteristically modifying the climate.

**Climate and Meteorology.**—The following tables exhibit the climatology of Strathfield Turgiss (the only station of the R. Met. Society in the district) during the ten years 1881 to 1890.

#### MONTHLY MEANS FOR TEN YEARS, 1881-90.

Station, STRATHFIELD TURGISS, WINCHFIELD, HANTS. Height above Mean Sea Level, 197 feet.

Rev. C. H. GRIFFITH, Observer.

MONTH.	TEMPERATURE OF AIR IN MONTH.			Mean Temperature of Air in Month.	Mean Relative Humidity, 9 a.m.	Amount of Sunshine.	Mean Cloud, 9 a.m.	RAIN.	
	Mean of Highest.	Mean of Lowest.	Mean Daily Range.					Days it fell.	Inches.
	°	°	°	°	%	hrs.			
January ...	43·2	31·8	11·4	37·5	91	...	7·7	16	2·14
February ...	45·1	33·4	11·7	39·2	90	...	7·7	12	1·86
March ...	49·3	33·0	16·3	41·2	84	...	6·9	13	1·55
April ...	55·6	36·7	18·9	46·1	77	...	7·0	13	1·65
May ...	63·4	42·5	20·9	53·0	74	...	6·6	13	1·97
June ...	69·0	48·2	20·8	58·6	76	...	7·1	11	1·86
July ...	72·1	51·1	21·0	61·6	74	...	6·8	15	2·35
August ...	70·8	50·9	19·9	60·9	76	...	6·3	13	1·99
September ...	65·7	47·3	18·4	56·5	83	...	6·9	13	2·10
October ...	56·3	40·1	16·2	48·2	88	...	6·9	16	2·53
November ...	49·6	37·3	12·3	43·4	90	...	7·1	17	2·75
December ...	43·0	31·8	11·2	37·4	92	...	7·5	14	1·86



## MEANS FOR TEN YEARS, 1881-90.—QUARTERLY AND YEARLY.

Station, STRATHFIELD TURGISS, WINCHFIELD, HANTS. Height above Mean Sea Level, 197 feet.

Rev. C. H. GRIFFITH, Observer.

QUARTERLY AND YEARLY.	TEMPERATURE OF AIR.			Mean Temperature of Air.	Mean Relative Humidity, 9 a.m.	Amount of Sunshine.	Mean Cloud, 9 a.m.	RAIN.	
	Mean of Highest.	Mean of Lowest.	Mean Daily Range.					Days it fell.	Inches.
Jan.—March ...	45·9	32·7	13·2	39·3	88	...	7·4	41	5·55
April—June ...	62·7	42·5	20·2	52·6	76	...	6·9	37	5·48
July—Sept. ...	69·5	49·8	19·7	59·7	78	...	6·7	41	6·44
Oct.—Dec. ...	49·6	36·4	13·2	43·0	90	...	7·2	47	7·14
Whole year ...	56·9	40·3	16·6	48·6	83	...	7·0	166	24·61

When these figures are analysed and studied it appears that the mean temperature of this district and its mean maximum temperature are higher than those on the neighbouring chalk; the mean minima the same. The mean relative humidity is higher than on the Downs, possibly because of the situation of Strathfield Turgiss on the Lodden. The amount of cloud is the same as on the Downs; but the rainfall is much less than there, being absolutely low, and practically the same as at Ramsgate, that is, half an inch less than at Regent's Park.

**Drainage and Water Supply, and Prevalence of Disease.**

—The places in the district of which we have obtained information under this head are Kingsclere, Hursly, Hungerford, Newbury and Farnham.

This will be found in Tables V. and VI. on pages 172 and 173. A few other points of interest in this connection with respect to Kingsclere are presented in the table on the opposite page.

**Therapeutic Effects and Uses.**—When we review the facts which we have discovered in connection with the north-east district of Hampshire, we find that it is a picturesque country, with a dry, bright climate, and on the whole a light, gravelly soil, lying in places on an impervious bed of clay. Its heaths and commons are suitable places for quiet rest from town life. The neighbourhoods of Farnborough and Fleet are now so accessible, that they may be occupied as places of residence by persons whose

work lies in London, but the character of the sub-soil requires to be carefully ascertained in every instance. Other parts, such as Eversley, Silchester and Kingsclere, are suitable for holiday rambles, possessing diverse kinds of interest beyond those with which Nature has provided them.

District.	Zymotic Death Rate.	No. of cases of Diphtheria notified last two years.	No. of cases of Ty- phoid Fever notified last two years.	Water Supply.		Soil.	System of Drainage in use.
				How obtained.	Charac- ters.		
Kingsclere.	0.35	None	3	Chiefly wells, some- times streams. Ponds in two villages.	Very hard.	Chalk, clay, gravel.	A scattered rural district, without drainage excepting Kingsclere <i>itself</i> , which drains direct into stream. The old system of pits is being done away with, and nearly the whole Union has small earth closets, which are frequently emptied and contents buried,

#### IV. THE FOURTH DISTRICT.

**The Eastern Border of Hampshire.**—This district is constituted by the western extremity of the great Wealden area of greensand and clay, which, after coursing from the sea at Folkestone, through Kent and Sussex, between the North and South Downs, crosses the border a short distance into Hampshire, and is lost beneath the chalk. From a geological and physical point of view, therefore, this district belongs properly to South Surrey and West Sussex.

Though it is but a limited stretch of country, its surface is highly diversified, and it presents many places of great natural beauty. Towards the west, the great rounded ridges of the chalk district, where they meet the denuded surface of the greensand, frequently end in bold conspicuous escarpments. On the east are the long high grounds of Lyss, Lynchmere, Hind-Head, and the









Hog's Back. Between these natural limits lies our district, a narrow tract of sloping and undulating country. Much of it is of "sand covered with heath and fern," as White describes the royal forest of Wolmer; in part it is woodland; and the rest of it is richly sylvan, cultivated and pastoral.

The soil, where it consists, as has been said, of greensand, in some places extending to a depth of hundreds of feet, is highly absorbent and very dry.

This district is drained by two streams, flowing respectively north and south, which are described by Gilbert White in his *Natural History of Selborne*, a village situated on our very western border, on the broken fringe of the chalk. "Nore Hill, a noble chalk promontory, [is] remarkable for sending forth two streams into two different seas. The one to the south becomes a branch of the Arun, running to Arundel, and so sailing into the British Channel: the other to the north. The Selborne stream makes one branch of the Wey; and meeting the Blackdown stream at Hedleigh, and the Alton and Farnham stream at Tilford-bridge, swells into a considerable river, navigable at Godalming; from whence it passes to Guildford, and so into the Thames at Weybridge; and thus at the Nore into the German Ocean."

The great tracts of wild country which constitute Wolmer Forest and its neighbourhood, Weaver's Down, Bramshott Common, the western shoulder of Hind-Head, and other places further to the north, are thickly clad with heather and bracken, and more or less sparsely with the common pine. Otherwise the trees and vegetation of this district do not call for special description from us.

**Climatology.**—Unfortunately no official records are available of the meteorology of this region.

**Drainage, Water Supply, and Prevalence of Disease.**—The chief facts relating to the sanitation of Petersfield, one of the most important centres in this district, are set forth in Tables VII. and VIII. on the opposite page.

**Therapeutic Effects and Uses.**—This district, presenting as it does a mild, bracing, inland climate, a perfect soil, and scenery of great natural beauty, with extensive airy prospects from the summits of the higher grounds and wide open expanses of heath and pine, offers itself as a valuable place of residence





or resort for the sedentary town-worker, which is still strangely unfamiliar to the people of London. The spring, with all its reviving influences, and the autumn with its changing tints and its refreshing coolness, are the most suitable seasons for visiting it; the elevated and open character of many parts permitting even the period of the fall of the leaf to be enjoyed with safety here. The walks and drives in this region are almost endless. Petersfield, Rake, Liphook, Selborne, and Kingsley are all suitable centres.

#### BOURNEMOUTH.

Bournemouth is situated in the extreme south-west corner of Hampshire, between Poole Harbour and Christchurch, a little to the west of the Needles. It is built on a flat pine-covered heath which abuts abruptly on the sea in the form of great brown sandy cliffs. Seaward the aspect of the town is due south; but it has developed less along the coast and more directly inland—on either side of the Bourne from which it takes its name. This small stream, pursuing a south-easterly course, occupies the bed of a considerable valley, and divides the town into two parts—the East Cliff on the eastern and northern side, and the West Cliff over against it. The East Cliff, the West Cliff, the Valley and the Coast are the four natural divisions of Bournemouth, and call for separate description.

The East Cliff over a great part of its extent slopes landward from the coast towards the valley, and has thus a westerly and south-westerly as well as a southerly aspect. This contour of the ground secures for the East Cliff peculiar protection from easterly and north-easterly winds, which is further increased by an abundant covering of pines and other vegetation. This is the older residential quarter of Bournemouth.

The West Cliff is more elevated, exposed and open than the other cliff; particularly that part of it which rises abruptly between the mouth of the Bourne Valley and the sea and is known as the South Cliff. Indeed the principal protection of the West Cliff from the cold quarters is afforded by the East Cliff. This is the newer part of Bournemouth, and contains the larger number of boarding-houses or *pensions*.

The Valley of the Bourne affords the maximum of natural protection from the wind which the place can claim. This feature has been further developed by art, the lower part of the valley—extending more than a mile in length—being laid out as public gardens, the chief municipal works of an ornamental kind in Bournemouth. They are tastefully planned and kept, full advantage being taken of the stream which flows through them; and the eastern slope of the valley, lying at the foot of the corresponding cliff and covered with pines, affords a perfectly sheltered, sunny, and quiet promenade and resting place. Unfortunately the lower part of the valley, whilst it is a valuable means of natural ventilation from the sea landwards, is visited by mists in certain kinds of weather when other parts of the town are clear; and the valley is also draughty in some weathers.

The Coast at Bournemouth presents striking and peculiar features. The principal of these is the almost complete absence of what is commonly known as a "marine front." Instead of formal parades and terraces, such as are familiar to us at Brighton, Weymouth, Weston-super-Mare, and indeed at so many of our seaside watering places—nature is here left undisturbed in the form of cliffs, rugged and high, bright with green and yellow gorse, broken by deep irregular chines and the Bourne Valley, and crowned with fringes of pines.

The natural means of protection from winds that Bournemouth as a whole enjoys are comparatively distant, and consist of the New Forest, Hengistbury Head and the Isle of Wight on the east, and the Purbeck Hills, lying beyond Poole Harbour, on the west.

The *trees and vegetation* in and around Bournemouth give it a character almost peculiar to it amongst towns. Pines are everywhere to be seen. On the East Cliff they are so abundant fringing the streets and level walks and sheltering the houses and gardens in the more quiet residential quarter, that Bournemouth seen at this part has been well described as a town in a wood. On the West Cliff the pines are distributed more sparsely, or are of much younger growth. All around Bournemouth the heath is covered with pine woods—Branksome on the west, Boscombe and Hinton Woods on the east, and others inland towards the north. In some parts of the East Cliff, as already described, the local



shelter afforded by the pines is very great, the force of the wind being completely broken. In winter and in stormy weather this is a feature of great value, but in the warm months of the year (particularly after wet or when the relative humidity of the air is high), although grateful shade can be obtained beneath the pines from the brilliant sun, the very luxuriance of the vegetation interferes with ventilation, and a feeling of excessive stillness, of closeness and oppression, is experienced on the south-western slope of the East Cliff and in the valley, where the pines and the underwood grow thickest and natural shelter is greatest. The evergreen vegetation which flourishes thus abundantly is refreshing to the eyes in winter, particularly to the eyes of visitors from other towns; but this very feature is said to prove monotonous and sombre to some persons, or even depressing. The aromatic emanations from the pines are believed to add to the salubrity as well as the pleasantness of the atmosphere. Beneath and about and between the pine trees there flourish in great luxuriance the furze, rhododendron, and holly.

**The Sea.**—The sea at Bournemouth lies full to the south, a wide expanse of brilliant water. On the eastern horizon stand the Needles and Alum Bay; on the west the view is more limited, abruptly bounded by Studland Point, just beyond Poole Harbour, with Old Harry and his Wife, two conspicuous pillar-like remnants of the chalk, which here dips under sea, making for the Isle of Wight.

Bournemouth may be said to enjoy, rather than to take full advantage of, the marine influence afforded by its situation on the coast. We have already described how the town as a whole has turned its back upon the sea and spread inland, availing itself more of the benefits of heath and pine than of those of wave and cliff. Indeed so important are the other elements of climate here—the sunshine, the dry warm soil, and the peculiar vegetation—that the influence of the sea is apt to be overlooked or disregarded. This however is not permissible. Bournemouth enjoys (1) the ordinary equalizing effect on the temperature of a marine situation; (2) the special influence in this respect of the Gulf Stream, with the local peculiarities of double tides; and (3) a great open, fresh expanse of sea. Sea fogs are much less frequent on the south than on the east coast.

To obtain the full influence of the sea, visitors have to promenade on the cliff walk, to lounge upon the beach, to visit the pier, or to make a sea trip on the local steamers. All this they can do; and the provisions for these ends, somewhat incomplete as they are, are likely to be considerably increased in the near future. A dry, well-kept and fairly level cliff walk is accessible to pedestrians and pony-chairs, but not to carriages. Necessarily it is fully exposed to the east, south and west winds.

The beach is sandy, shallow and safe, but the depth of it uncovered at low water is considerably less than on most other parts of our coasts, in consequence of the secondary tide developed along the Solent.

The pier has been carried 838 feet into the sea, and is provided with specially constructed shelters in which the marine effects of the atmosphere can be largely enjoyed even by invalids without undue exposure to the wind.

The more robust visitors have an opportunity during the summer season of spending several hours daily upon the water by taking sea trips to Swanage, Weymouth or the Isle of Wight. Ordinary boating can also be safely indulged in.

The temperature of the surface of the sea in the different months appears not to have been recorded.

**Geological Formation ; Soil ; Dryness.**—The geological formation of Bournemouth and its neighbourhood has been already described in connection with the second district of Hampshire, in which it lies. The soil is an important element of the climate of the place, consisting as it does of highly pervious, dry, warm gravel. The subsoil is sand (with rare beds of clay), extending, it is said, to a depth of at least fifty feet, where it doubtless rests on the chalk. Here and there the clay crops out on the surface.

**Meteorology.**—Table I exhibits the principal facts relating to the meteorology of Bournemouth arranged as means of the ten years 1881–1890.<sup>1</sup>

The prevailing winds are given on page 164.

The amount of sunshine was not recorded before the spring of 1892. In eight months of 1892, from May to December inclusive, it measured 1119 hours and 25 minutes. See Southbourne, p. 195.

<sup>1</sup> For these figures the Committee desires to thank the Town Council of Bournemouth, and Mr. Horsfall, M.A. Oxon., F.R.C.S.



TABLE I.  
METEOROLOGICAL MEANS FOR TEN YEARS 1881—1890.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
Mean temperature at 9 a.m. . . .	40·3	40·7	42·8	49·8	56·1	61·5	64·8	63·6	58·8	51·0	46·3	41·0	51·4
Mean Minimum Temperature . .	34·4	34·5	34·9	38·5	44·6	50·3	54·2	52·6	49·7	42·9	39·8	34·6	42·6
Mean Maximum Temperature . .	44·7	45·8	48·5	54·9	62·0	68·2	71·0	70·9	65·8	56·3	51·0	45·0	57·1
Mean Temperature . . . . .	39·6	39·7	41·7	46·2	53·3	59·4	62·6	61·7	57·7	49·8	45·2	39·7	49·7
Mean Relative Humidity . . . .	85	89	80	68	69	69	69	70	81	81	87	85	77·7
Mean Amount of Cloud at 9 a.m. .					Not observed until lately.								
Mean Rainfall . . . . .	2·47	1·85	1·83	1·61	2·13	1·97	2·07	1·84	2·46	3·14	3·36	2·53	27·26
Mean Number of Rainy Days . .	14·3	10·5	11·5	8·7	10·3	11·3	14·3	15·0	11·5	18·8	17·2	14·7	158·3

(Taken for the Council of the Borough of Bournemouth by Mr. Primavera.)

When these results are analysed and compared with those of other places it is found that:—

(1) The mean temperature for the whole year at 9 a.m. is  $51.4^{\circ}$ —the highest of any station in these islands.

(2) The mean temperature at 9 a.m. for the six months, October to March inclusive, is  $43.7^{\circ}$ , as compared with  $41.066$  at Regent's Park.

(2a) The mean temperature at 9 a.m. for the six months, April to September inclusive, is  $59.1^{\circ}$ , as compared with  $56.65^{\circ}$  at Regent's Park.

(3) The mean minimum temperature for the whole year is  $42.6^{\circ}$ —nearly the same as that of Regent's Park.

(4) The mean maximum temperature for the whole year is  $57.1^{\circ}$ , as compared with  $56.1^{\circ}$  at Regent's Park, Ventnor, and Guernsey.

(5) The mean maximum temperature for the six months, April to September inclusive, is  $65.4^{\circ}$ .

(6) The mean maximum summer temperatures are as follows, compared with those of Regent's Park:—

	June.	July.	August.
Regent's Park ... ..	68.1	71.0	70.0
Bournemouth ... ..	68.2	71.0	70.9

(7) The mean maximum temperature for the six winter months, October to March inclusive, is  $48.5^{\circ}$ , as compared with  $47.06^{\circ}$  at Regent's Park, distributed as follows:—

	Oct.	Nov.	Dec.	Jan.	Feb.	March.
Regent's Park ...	55.2	49.2	42.9	42.9	44.1	48.1
Bournemouth ...	56.3	51.0	45.0	44.7	45.8	48.5

(8) The mean temperature for the year is  $49.7^{\circ}$ —the same as that of Bude.

(9) The mean relative humidity at 9 a.m. for the year is  $77.7^{\circ}$ ,—decidedly the lowest recorded in this country.



(10) The mean relative humidity at 9 a.m. for the six winter months, October to March inclusive, is  $84.5^{\circ}$ , which is  $2.1^{\circ}$  less than that for Regent's Park.

(11) The mean total rainfall for the year is 27.26 inches, being 2.09 inches more than at Regent's Park.

(12) The mean total rainfall for the six winter months, October to March inclusive, is 15.18 inches, as compared with 12.33 at Regent's Park.

(13) The mean number of rainy days (0.01 inch and upwards) per annum is 158.3, being 6.7 less than at Regent's Park, and an extremely favourable record as compared with most other stations in the kingdom.

(14) The mean number of rainy days during the six winter months, October to March inclusive, is 87, as compared with 91 at Regent's Park.

The causes of bad weather at Bournemouth appear to be :—(1) Fog, very rarely. (2) Rain; but in this connection it may be repeated that the ground dries very quickly. (3) Cold, which may be extreme on the cliff walks. (4) Wind, which is occasionally very high in the spring, blowing from the east. It must also be remembered that according to Scott, the south-west of England—the entrance to the Channel—is the district of Great Britain most frequently swept by gales; that south-west gales are largely preponderant; and that gales are most prevalent in the winter half year. At the same time, protection is abundantly present at Bournemouth, thanks to the conformation of the land, to the pine-trees, and to artificial shelters. Altogether, it has been estimated that there are, on an average, about two days a week during the winter season when patients cannot go out safely, in consequence mainly of rain, and occasionally of cold wind and dust.

**Sanitation, Drainage, Water Supply.**—Bournemouth is a very openly built town, the houses in the residential quarter being for the most part detached. It has been said that Bournemouth, with one-third the population of Brighton, covers three times the area of that place.

The town possesses a complete main drainage system with outfall into the sea. The flow is continuous in all states of the tide; and in addition to this provision, there are more than forty automatic flushing-tanks, provided with sea water, throughout the

town. The municipal regulations relative to the internal sanitary arrangements of the houses are very strict. The outlying districts are not well drained.

The water supply of Bournemouth is above suspicion. It is derived from two sources: first, a well under the river Stour at Longham, a distance of 3 or 4 miles from the town; second, the moors at the top of the valley. The water from the first source is somewhat hard; that from the second is soft, off the peat, and sometimes rather highly coloured. The combined water is of very excellent potable quality, clear, but sometimes not too abundant. The following is the report of an analysis by Drs. E. and P. E. Frankland, furnished by Mr. Philip W. G. Nunn, Medical Officer of Health.

REPORT OF ANALYSIS EXPRESSED IN PARTS PER 100,000.

No. of Sample, 6921.	Total solid matter.	Organic carbon.	Organic nitrogen.	Ammonia.	Nitrogen as Nitrates and Nitrites.	Total combined Nitrogen.	Previous sewage or urinal contamination	Chlorine.	Hardness.		
Descriptions:									Tem.	Per.	Total.
BOURNEMOUTH											
Water supply ...	15.40	...	.023	...	...	.023	...	2.3	4.3	3.9	8.4
Water taken from main op- posite County Gates, West- bourne ...	...	.178	...	0	0	...	0	...	...	...	...

In their report they remark, "This water is almost quite clear; it contains only a moderate proportion of organic matter, which appears to be entirely vegetable in origin, and bears no evidence whatever of previous contact with sewage or other refuse animal matter. It is of excellent quality for drinking and all other dietetic purposes. As this water is only of moderate hardness, it may also be advantageously employed for washing and steam purposes." (Drs. E. and P. E. Frankland.)

In connection with the water supply it may be mentioned that for a time the streets were watered with sea-water. It was found, however, that the pervious soil was becoming so saturated with



salt, the streets so damp, and the dust so saline and irritant to the respiratory organs, that the practice had to be discontinued.

The following is a more recent analysis of the water :—

“17, BLOOMSBURY SQUARE,  
“LONDON, W.C.

“I have analysed the ‘sample of water taken direct off the main at the cabstand in the Sanatorium Road, Bournemouth, by Wm. Geo. Cooper, Chief Sanitary Inspector.’ The analytical data are appended :—

One gallon contains the following number of grains and decimal parts of a grain of the respective substances.

Total suspended solid matter, dried at 250° F. . . . .	none
Total dissolved solid matter, dried at 250° F. . . . .	17·0
Ammoniacal matter, yielding 10 per cent. of nitrogen . . . . .	0·00
(Equal to ammonia per million 0·00.)	
Albumenoid organic matter, yielding 10 per cent. of nitrogen . . . .	0·007
(Equal to ammonia per million 0·01.)	
Nitrates . . . . .	none
Nitrates containing 17 per cent. of nitrogen . . . . .	0·5
(Equal to grains of nitrogen per gallon 0·08.)	
Chlorides containing 60 per cent. of chlorine . . . . .	2·7
(Equal to grains of chlorine per gallon 1·6.)	
Hardness reckoned as chalk-grains or “degrees”—	
Removed by ebullition . . . . .	7·0
Unaffected by ebullition . . . . .	5·0
Total Hardness . . . . .	12·0
Lead or copper . . . . .	none
Physical examination . . . . .	satisfactory
Oxygen absorbed in three hours . . . . .	0·01

“Opinion—This water must be classed amongst the purest of potable waters supplied to towns.

“I have rarely examined so pure and in all respects excellent a sample of water.

(Signed)

“JOHN ATTFIELD,

“Ph.D., F.R.S., F.L.C., F.C.S.

“October 7th, 1892.”

**Mortality, Common Causes of Death, Prevalence of Infectious Diseases.**—The following returns of the mortality with the chief causes of death, and of the new cases of infectious sickness, in the urban sanitary district of Bournemouth, coming to the notice of the authorities, are taken from the report of the Medical Officer of Health for 1892.

1. TABLE OF DEATHS DURING THE YEAR 1892, IN THE URBAN SANITARY DISTRICT OF BOURNEMOUTH, CLASSIFIED  
According to Diseases and Ages.

MORTALITY FROM ALL CAUSES AT SUBJOINED AGES.							MORTALITY FROM SUBJOINED CAUSES, DISTINGUISHING DEATHS OF CHILDREN UNDER FIVE YEARS OF AGE.																				
At all ages.	Under 1 year.	1 and under 5.	5 and under 15.	15 and under 25.	25 and under 65.	65 and upwards.	Smallpox.	Scarlatina.	Diphtheria.	Membranous Croup.	FEVERS.						Measles.	Whooping Cough.	Diarrhoea and Dysentery.	Rheumatic Fever.	Ague.	Phthisis.	Bronchitis, Pneumonia, and Pleurisy.	Heart Disease.	Injuries.	All other Diseases.	Total.
											Typhus.	Enteric or Typhoid.	Continued.	Relapsing.	Puerperal.												
630	117	31	24	68	260	130	Under 5	...	3	3	...	...	...	...	2	1	11	...	...	...	6	28	3	4	87	148	
							5 upwards.	...	4	...	...	1	...	...	...	...	1	...	...	...	145	86	54	10	179	482	
Rate per 1,000	3.1	.8	.6	1.8	6.9	3.4		...	.18	.08	...	.02	...	...	.08	...	.31	...	...	...	4.01	3.02	1.5	.37	7.06	16.6	



II. TABLE OF POPULATION, AND OF NEW CASES OF INFECTIOUS SICKNESS COMING TO THE KNOWLEDGE OF THE MEDICAL OFFICER OF HEALTH DURING THE YEAR 1892, IN THE URBAN SANITARY DISTRICT OF BOURNEMOUTH, CLASSIFIED ACCORDING TO DISEASES AND AGES.

POPULATION AT ALL AGES		Aged under five or over five.	NEW CASES OF SICKNESS COMING TO THE KNOWLEDGE OF THE MEDICAL OFFICER OF HEALTH.										
Census 1891.	Estimated to middle of 1892.		Smallpox.	Scarlatina.	Diphtheria.	Membranous Croup.	FEVERS.						
							Typhus.	Enteric or Typhoid.	Continued.	Relapsing.	Puerperal.	Cholera.	Erysipelas.
37,781	40,500	Under five Five upwards	... ...	28 51	8 11	2 ...	... ...	.. 11	... ...	... ...	... 1	... ...	... 13

The Registrar-General's Report contains no separate returns from Bournemouth, which is included under Christchurch.

In connection with these statistics, as well as with the subject of the prevalence of certain diseases in Bournemouth, it is essential to bear in mind a caution communicated to this Committee by the late Superintendent of Medical Statistics. Dr. Ogle warns us against a fallacy which is peculiarly likely to occur in connection with the death-rate in Bournemouth. "It is quite possible, nay, quite probable, that some of the places which are held to be especially suitable, say for phthisical patients, would show an unusually high phthisis mortality owing to the influx of persons suffering from that malady."

The deaths of visitors are included in the above figures, many of whom came to Bournemouth in the last stages of consumption and other respiratory disorders.

Dr. Nunn roughly estimates the deaths of visitors as one-third of the whole number; and reckons the death-rate of the inhabitants at about 10 in place of 16·6 per 1,000.

It deserves to be noted as a fact, which at first sight appears remarkable, that the *common cause of death* at Bournemouth is disease of the respiratory organs, especially amongst children. It must not be forgotten, however, that 28 per cent. of all deaths in this country are referable to the same class of disease, phthisis, of course, included. Heart disease, apoplexy and "old age" are also amongst the chief causes of death.

Longevity is said to be common, and this in spite of the fact that Bournemouth is still too young to have many aged residents.

Anæmia of an obstinate type is common amongst the young servant-maids from the peasantry of Dorset who supply the many lodging-houses.

Patients suffering from anæmia do exceptionally well here, particularly in the part lying towards Boscombe. The sea trips in summer are a valuable help in the management of these cases.

*Phthisis.*—(1) *Prevalence amongst Inhabitants.*—It is a difficult task, perhaps one that is impossible, to estimate with accuracy the prevalence of phthisis amongst the "inhabitants of Bournemouth."

In the first place, Bournemouth is still altogether of too recent growth for its population to have developed any special character of constitution referable to endemic causes. Most of the adult "natives" must be in reality immigrants.

Secondly, many phthisical persons coming for the benefit of their health, and recovering more or less, have settled permanently here. Dying ultimately of (or at least with) tuberculosis, their cases are liable to be reckoned as native, when in reality they were imported. (Dr. Ogle.)

Thirdly, such persons are likely to transmit by inheritance the proclivity to tuberculosis. Nevertheless, in the genuine inhabitants phthisis is said to be "very uncommon."

(2) *Effect of Climate.*—The general opinion of the local practitioners, as expressed broadly, is that "most cases of pulmonary tuberculosis improve at Bournemouth." At the same time it cannot be represented as equal to the best of the foreign climates, such as the Riviera, the Alpine stations, or the South African resorts. Dr. C. Theodore Williams's results are: twenty patients, each one winter at Bournemouth; six much improved, seven improved, two stationary, and five worse.<sup>1</sup>

Passing to particulars, we find that some classes of cases are greatly benefited, that others do badly, and that an indifferent result is observed in but few. These results may be grouped as

<sup>1</sup> *The Influence of Climate in the Prevention and Treatment of Pulmonary Consumption*, 1877, p. 57.



follows, it being understood that the statements are of a general character only :—

(1) Cases of active localised pulmonary tuberculosis in the first stage improve rapidly at Bournemouth : such as are early discovered and hurried away from work, especially in towns.

(2) Active phthisis in the stage of softening does not improve ; and when the disease is acute, and the patient confined to bed or even to the house, the results are decidedly unfavourable.

(3) Quiescent or “arrested” phthisis is greatly benefited by residence at Bournemouth, whether the cases belong to the dry cavernous or to the fibroid type of disease. These types form a large proportion of the patients who may be daily seen enjoying the advantages of the cliff walk, the pier, and the sea trips.

(4) Chronic cavernous cases with abundant expectoration (“secreting cavities”) and the “bronchitic type” do not do well.

(5) Opinion appears to be divided on the value of Bournemouth in phthisis complicated with bronchial catarrh.

(6) As regards hæmoptysis, it is reported by some local observers as being comparatively frequent ; by others as uncommon ; and hæmorrhagic cases are said to be benefited here.

*Scrofula and Tuberculous Diseases excepting Phthisis.*—Most of the local observers declare that scrofula is not only uncommon in the native population of Bournemouth, but is greatly benefited by the climate in the case of visitors. The results (in this direction) obtained at the local hospital for hip disease with twenty beds, in connection with the Alexandra Hospital in London, are very favourable. Some cases of enlarged glands improve much, particularly on the higher grounds.

*Bronchitis and Catarrh.*—The frequency of acute pulmonary disease as a cause of death has been already indicated. Bronchial catarrh is common amongst the adult residents ; acute bronchitis the reverse. The effect of the climate on the subjects of chronic bronchitis sent to Bournemouth for treatment is, in the opinion of most of the local observers, decidedly favourable. It is represented that winter cough in persons over fifty is kept in abeyance by residence here ; that visitors with chronic bronchitis quickly improve ; and that the dry soil, the shelter afforded by a carefully selected residence, the sedative influence of the atmosphere, and

the exhalations from the pines all contribute to these effects. Recurrent catarrh with asthmatical relations is particularly relieved in some instances. *Asthma* is regarded by most of the local observers as uncommon; by all the observers as beneficially affected by the climate of Bournemouth, particularly when it belongs to the nervous type. It must also be remembered that Bournemouth presents such a variety of climate as regards altitude, shelter and exposure, fresh and confined air, and perhaps mist (at any rate valley *versus* cliff) that asthmatics may do well in one part of it when another part is found to disagree with them. On the whole they are more comfortable at some distance from the sea. As might be expected, a certain number of asthmatics reside here permanently because they cannot live elsewhere.

One excellent authority on Bournemouth, however, does not consider the climate beneficial in chronic bronchitis, and regards this opinion as corroborated by the evidence of a changeable climate which is to be found in the meteorological records.

*Pneumonia* is rare in Bournemouth; and local opinion is unanimous that this is an excellent place for convalescents from acute pneumonia, including those in whom resolution is delayed.

*Pleurisy*.—Similar results are obtained with respect to acute pleurisy; it is not of frequent occurrence in the resident population, and convalescence in protracted cases is satisfactory. Empyema does well here after operation.

*Acute Renal Dropsy* is reported to be practically unknown in Bournemouth, even amongst dispensary and hospital patients. A very few cases are sent here for treatment, and do well.

*Chronic Albuminuria*.—Chronic Albuminuria is probably of ordinary frequency. It must be noted, however, that this is one of the chronic diseases for which persons take up their abode permanently at Bournemouth; the writer himself knowing of three instances in medical men. There is satisfactory evidence that such cases may lead a comfortable and indeed an active existence in Bournemouth for an indefinite period.

*Calculus and Gravel; Rheumatism and Neuralgia*.—Calculus and gravel are said to be almost unknown in Bournemouth; and this although thickness of urine is a very common complaint in association with muscular rheumatism, neuralgia, indisposition to



exertion and sore throat. Facial, occipital and intercostal neuralgia occurs, and is said to be peculiarly obstinate. These troubles are frequent in all classes. As far as experience goes, patients with gravel are benefited here. Although acute rheumatism is rare, the value of this climate in rheumatic diseases is more than doubtful.

*Diseases of the Skin: Eczema.*—Eczema is common in a mild form amongst the permanent population; and in some instances sufferers from this disease have been compelled to seek a place of residence less exposed to the south-west winds. On the other hand, eczema in visitors is said to be benefited, particularly when associated with asthma and gout.

*Malaria*, unknown as an endemic disease, is treated with great success at Bournemouth, and many sufferers from this affection have taken up their permanent residence here.

*Typhoid Fever.*—It will be seen from the Return of the Medical Officer of Health that only 0·05 deaths per thousand occurred from typhoid fever in Bournemouth in 1892 as compared with 0·20 for the whole of England (1881–90). On closer inquiry it is found that the disease is not endemic, every recent case having been imported; and that it has never spread to any extent under these circumstances.

Bournemouth has an excellent reputation as a place for convalescence after typhoid fever.

*Diarrhœa* is said to be less common here than in any other town in England.

*Scarlet Fever.*—Scarlet fever occurs sporadically only, and the return for Bournemouth is said to be the lowest on the whole coast. In 1892 the mortality from this cause was *nil*. When it has been imported, the spread of the disease has been quickly arrested by means of the isolation hospital and the adoption of stringent sanitary measures.

*Diphtheria* occurs only in a few instances annually, and mainly in a neighbourhood which is badly drained. Only seven deaths were referred to this cause in 1892.

*Follicular Tonsillitis* is common, particularly in autumn and in damp weather with a low barometer.

**Therapeutic Effects and Uses.**—When we review and summarise the facts collected under the preceding heads, we are able to

reach certain conclusions, first, with respect to the special features presented by Bournemouth as a health resort; and secondly, as regards the diseases which are calculated to be benefited by it or the reverse, respectively.

1. *Special Features as a Health Resort.*—Bournemouth is distinguished by the general beauty of its position, which combines the attractions as well as the wholesome influences of sea and heath. As a whole, compared with England, it possesses a mild, bright, and fairly dry climate. The atmosphere is naturally pure, sunny, free from fog, redolent of the pine, of low relative humidity, and comparatively undisturbed by high or cold winds. The soil is dry and warm, permitting patients to sit with comparative safety in the open air; and it supports an abundant and luxuriant growth of non-deciduous trees and shrubs. The town area is very large in relation to the number of houses and inhabitants; and within these wide boundaries the place presents a remarkable variety of local climate—cliff, valley and wood—a fact which ought never to be forgotten when patients are sent here: not “Bournemouth,” but one part or other being recommended.

At the same time, Bournemouth is not free from the drawbacks common to the best of the winter resorts in England as compared with those in more favoured countries. Like other places on our south coast, it is subject to frequent and uncertain spells of bad weather, in the form of wet, cold, or both combined, and to even more dangerous, because deceptive, visitations of high east winds in the early spring.

More specifically, the atmosphere of Bournemouth is in some parts of the town and in some kinds of weather “close” and “relaxing.” Like so many other prosperous health resorts, it is also increasing too rapidly in area and polluting its atmosphere with smoke.

2. Judged by its features as a whole, Bournemouth would appear to be *indicated* as a winter resort in chronic diseases of the lungs, especially phthisis, and for delicate and debilitated subjects; and as a residence in the spring and autumn months for persons temporarily exhausted by a hard and over-anxious life. *Per contra* it does not commend itself for selection as a place for rearing and educating healthy, thriving boys and girls.

These considerations are strictly deductive only, but Bourne-



mouth has now been under a sufficiently long and close scrutiny to be judged by results.

It is not difficult to summarise the kinds of cases which have been benefited by it; and they are chiefly as follows:—

(1) Cases of pulmonary tuberculosis which would do well at any good health resort. (2) Pulmonary tuberculosis in the incipient stage. (3) Quiescent pulmonary tuberculosis when the patient can spend a number of hours continuously in the open air. (4) To these may perhaps be added patients in the last stage of phthisis from our colder, dull, or gloomy northern manufacturing towns,—who often enjoy an extension of life here. One of the most striking features of the results obtained from this part of the inquiry is that opinion (especially the opinion of patients and patients' friends) is very sharply divided with respect to the influence of Bournemouth on phthisis. It is pronounced either to be "good" or to be "bad"; very rarely to be "indifferent." It will probably be found that these extremely divergent views are both correct; and that whilst such cases as can take advantage of outdoor life do well, those which are confined to the house suffer from want of freshness of atmosphere, and do badly. (5) Chronic bronchitis without fever, and particularly recurrent bronchial catarrh with a moderate amount of expectoration. Asthma, whether neurotic or catarrhal, the different parts of the town being successively tried, if necessary. (6) Chronic Bright's disease, particularly of inflammatory origin. (7) The subjects of chronic malaria. (8) Sufferers from chronic gastric catarrh with emaciation. (9) The victims of nervous overwork, particularly with insomnia, provided they do not settle too close to the sea. (10) Delicate persons generally, including more especially elderly and aged people and feeble and rickety children.

On the other hand, certain classes of cases are found not to do well, or even to do badly, at Bournemouth. Such are (1) persons confined to the house. This applies chiefly to consumptives, but in some degree to all visitors and to domestic servants who have to spend most of their time indoors. Such persons suffer from the "relaxing" effects of stillness and closeness of atmosphere, particularly if resident in the more sheltered parts of the East Cliff; and even the ordinary inhabitant of the town tends to lapse into an easy, languid habit, which is best prevented or removed by

a visit inland or to a more bracing part of the coast, such as Swanage, or even Canford Cliffs—only three miles away. Necessarily this drawback applies in the instance of every case sent to Bournemouth, however suitable otherwise, when confined to the house by bad weather. There is then little choice for the patient in the way of occupation beyond the dulness of his sitting-room and the unwholesome atmosphere of the smoking-room and billiard-room. Some place of resort in such circumstances is urgently required—provided it be thoroughly ventilated, and furnish occupation or amusement of a cheerful kind. (2) The subjects of pulmonary tuberculosis in its active stages, especially when attended with much fever and profuse expectoration. If these patients have not the strength nor the inclination to stir out of doors, they must feel severely the depressing influence just referred to, particularly in still, wet weather, when damp clings to the close vegetation of the East Cliff. (3) The subjects of dry "irritable" catarrh of the larynx and bronchi. (4) Sufferers from neuralgia.

The Committee desires to thank the members of the profession at Bournemouth who have assisted it in the preparation of this Report, particularly Drs. Cory, Davison, Duncan, Embleton, Hyla Greves, Mahomet, Nunn, Philpots, B. Scott, Thomas, and Weary.

#### SOUTHBOURNE-ON-SEA.

Southbourne-on-Sea consists of a few detached and semi-detached villas and a short terrace of shops on a rugged heath which crowns the sandy cliff about three and a half miles to the east of Bournemouth. Its site, whilst practically a table-land 100 feet above the sea, slopes gently landwards from the edge of the cliff; and the place possesses little or no local protection from wind or rain beyond such as is afforded by this situation, and a scattered growth of young pines and high hedges of gorse. Its exposure is due south. The houses are new and look bare, and a good many of them are untenanted. It possesses, further, a comfortable-looking hotel, a church, and a short pier. As distinguished from Bournemouth, there is an undercliff drive and promenade with a sea-wall—still of limited extent.



**Geology and Soil.**—The geological formation and soil of this place differ in no important particular from those of Bournemouth, consisting of warm gravel and sand of great depth. The dryness of houses on the cliff and heath must be assured, but a short terrace built on the undercliff would appear to be more doubtfully situated as regards damp.

**Meteorology.**—Southbourne is one of the stations of the Royal Meteorological Society, and complete records are available for the ten years selected for the purposes of this report. Abstracts of these are given in the tables on the opposite page.

Several points of importance in connection with the climate of Southbourne-on-Sea which have been deduced from these tables will be found in the description of the South-western and Southern Division of Hampshire at page 162. To this the reader is particularly referred. The direction of the prevailing winds is fully set forth at p. 164.

**Drainage and Water Supply.**—Within the last two years a system of pipe drainage has been laid down to the sea. The elevated character of the land affords abundant fall. The water supply is from Bournemouth, and of excellent character (see Bournemouth). Many of the houses are fitted with baths. Gas is also laid down from Bournemouth.

**Prevalence of Disease and Influence of Climate.**—The population of Southbourne being so limited and its history as a whole so very brief, we cannot well speak of the prevailing diseases of the place. It is more easy to name the affections that have been observed to be favourably influenced by residence here. Anæmia and debility are benefited. Scrofula and tuberculous diseases improve under the influence of the pure air and dry soil. Phthisis also undoubtedly improves, especially neurotic cases. The effect of Southbourne on asthma is uncertain, as usual, and some cases "are well nowhere else." Acute renal dropsy occurs in young subjects, but all cases have done well in the experience of Dr. Dawson, who has kindly supplied the information on this part of the subject and other important points. Chronic albuminuria appears to be uncommon. Calculus and gravel are benefited by residence at Southbourne. Rheumatic affections, including neuralgia, are somewhat prevalent, but they all do well.

Rheumatic arthritis is almost unknown. Eczema is very rare.

## MONTHLY MEANS FOR TEN YEARS, 1881-90.

Station, SOUTHBOURNE, BOURNEMOUTH, HANTS. Height above Mean Sea Level,  
90 feet.

T. A. COMPTON, B.A., M.D., F.R.Met.Soc., Observer.

MONTH.	TEMPERATURE OF AIR IN MONTH.			Mean Tempera- ture of Air in Month.	Mean Relative Humidity, 9 a.m.	Amount of Sunshine.	Mean Cloud, 9 a.m.	RAIN.	
	Mean of Highest.	Mean of Lowest.	Mean Daily Range.					Days it fell.	Inches.
January ...	44.2	35.5	8.7	39.9	89	hrs. 50	7.0	16	2.28
February ...	45.1	35.7	9.4	40.4	88	71	6.8	12	1.91
March ...	47.9	35.4	12.5	41.6	82	116	5.9	12	1.75
April ...	53.1	38.9	14.2	46.0	76	147	6.0	11	1.71
May ...	59.3	44.8	14.5	52.1	75	213	5.5	12	2.02
June ...	64.7	50.3	14.4	57.5	75	201	5.7	11	1.91
July ...	67.5	53.5	14.0	60.5	77	204	6.0	14	2.04
August ...	68.0	52.7	15.3	60.4	74	200	5.5	12	1.77
September ...	64.1	50.0	14.1	57.0	82	131	5.8	12	2.37
October ...	56.3	43.4	12.9	49.8	85	107	5.8	15	2.96
November ...	50.5	40.8	9.7	45.6	89	61	6.8	17	3.20
December ...	44.7	35.6	9.1	40.2	89	49	6.9	16	2.41

## MEANS FOR TEN YEARS (1881-90)—QUARTERLY AND YEARLY.

Station, SOUTHBOURNE, BOURNEMOUTH, HANTS. Height above Mean Sea Level,  
90 feet.

T. A. COMPTON, B.A., M.D., F.R.Met.Soc., Observer.

QUARTERS AND YEAR.	TEMPERATURE OF AIR.			Mean Tempera- ture of Air.	Mean Relative Humidity, 9 a.m.	Amount of Sunshine.	Mean Cloud, 9 a.m.	RAIN.	
	Mean of Highest.	Mean of Lowest.	Mean Daily Range.					Days it fell.	Inches.
Jan.—March .	45.7	35.5	10.2	40.6	86	Hours. 237	6.3	40	5.94
April—June ..	59.0	44.7	14.3	51.9	75	561	5.7	34	5.64
July—Sept. ...	66.5	52.1	14.4	59.3	78	535	5.8	38	6.18
Oct.—Dec. ...	50.5	39.9	10.6	45.2	88	217	6.5	48	8.57
Whole year ...	55.5	43.1	12.4	49.3	82	1550	6.1	160	26.33



Cold winds with careless exposure may induce a dermatitis of short duration. Malarial affections do well at Southbourne. There has been no case of typhoid fever here during the last ten years; nor any case of diarrhoea, beyond such as may have been induced by errors in diet. Several mild cases of scarlet fever have been brought from the low-lying district of Christchurch, or from Pokesdown—a populous and poor district one mile distant. Diphtheria has occurred in several instances, with some deaths, among the poor whose children came in contact with the residents of Pokesdown. There have been no cases of endemic sore throat. The history of this place does not admit of an answer to the inquiry as to the common causes of death, it being comparatively new. There are, however, some residents of advanced age.

**Therapeutic Effects and Uses.**—The value of Southbourne as a health resort may be most profitably discussed in connection with that of Bournemouth. Lying as it does at the eastern extremity of Christchurch Bay, Southbourne-on-Sea is much more exposed and more bracing than Bournemouth. The air also is free from all traces of contamination by smoke. On the other hand, the place is necessarily very quiet—not to say dull. The principal forms of occupation, apart from those afforded by the beach and country walks, are lawn tennis in summer and golf.

These features of Southbourne are evidences both of the strength of its claims for consideration in certain kinds of diseases and in certain classes of patients, and of the drawbacks that attend the recommendation of it to others. It will be necessary to keep these considerations before the mind when the question of Southbourne *versus* Bournemouth as a winter resort, or as a place of residence, is raised in a practical form. The great value of this part of the coast is recognised in the treatment of affections of the chest and kidneys, as well as in convalescence from acute diseases and after operations, thanks to the nature of the soil and vegetation, to the equability of the climate and its mildness in winter, to the fact that it is one of the brightest stations in England, and to the moderate rainfall, particularly the small number of rainy days. It is still too early, however, to speak confidently of the exact therapeutical applications of Southbourne itself. It is but the germ of a town. Its history belongs to the future.

## MILFORD-ON-SEA.

This village is situated on the south coast of Hampshire, fourteen miles from Bournemouth, five from Lymington, and twenty-four from Southampton; directly opposite the Needles, and just within the east horn of Christchurch Bay. The place consists of the old village of Milford, and the new building-estate of Milford-on-Sea.

The old village lies in a valley—the bed of a small stream which falls into the Solent near Hurst Castle. It is well protected from all winds; but it is damp, being only a few feet above the level of the sea.

The new portion is built on a plateau to the west of the old village, behind the cliffs, which rise to a height of over 50 feet. The houses, still comparatively few in number, with a single hotel, are detached buildings, each standing in its own garden. They are exposed to winds from the south and south-west; and in summer are more bracing than the old village. This new part commands a lovely view of the entrance to the Solent, the Isle of Wight, with the Needles and Alum Bay; immediately beneath it is Hurst Castle, and to the west is the great sweep of Christchurch Bay. It is partly protected from the north and north-east by rising ground and the New Forest; and when northerly and north-easterly winds blow, the shore—where a walk has recently been made—is always warm. When the south-west wind is blowing, protection can be found in the lanes. The beach is of shingle, with a small belt of sand.

The country around—the straggling fringe of the New Forest—is undulating and well wooded, the principal trees being oak, fir, and beech; and there are also several tracts of common land with gorse and heather. The soil is loam about 3 feet deep upon some 30 or 40 feet of gravel, and beneath this is a blue clay.

Vegetation is very abundant; all the usual spring flowers, such as violets, primroses, and daffodils, appearing very early.

**Meteorology.**—For the details under this head, as well as for valuable information on Milford in general, the Committee is indebted to Mr. Robert Bruce, M.R.C.S., D.P.H. Cantab., the local practitioner.



TABLE I.

## TEMPERATURES.

Temperatures registered at 9 A.M. in shade, 4 feet above ground.

	During Month.		Mean of	
	Highest.	Lowest.	Highest.	Lowest.
1891.				
June ... ..	75	36	65	48
July ... ..	74	48	64	52
August ... ..	69	43	64	53
September ... ..	78	45	64	52
October ... ..	60	33	56	45
November ... ..	55	30	50	40
December ... ..	54	20	47	37
1892.				
January ... ..	53	25	42	33
February ... ..	50	20	46	36
March ... ..	58	22	44	31
April ... ..	72	25	55	35
May ... ..	72	30	60	44
June ... ..	78	38	62	47
July ... ..	76	46	65	52
August ... ..	76	44	67	54
September ... ..	67	37	63	50
October ... ..	58	30	53	40
November ... ..	56	32	50	31
December ... ..	51	22	43	34

TABLE II.

## RAINFALL.

Rainfall registered during Month.

1891.		Days rain fell.	1892.		Days rain fell.
			January ...	1·10 in.	12
			February ...	0·92 "	13
			March ...	0·79 "	6
			April ...	0·75 "	7
			May ...	0·88 "	5
June ... ..	1·64 in.	11	June ...	1·16 "	12
July ... ..	1·28 "	12	July ...	2·25 "	10
August ...	4·78 "	19	August ...	3·92 "	13
September ...	1·02 "	10	September ...	3·06 "	11
October ...	8·21 "	21	October ...	3·90 "	15
November ...	3·81 "	15	November ...	2·23 "	6
December ...	4·23 "	22	December (?)	0·79 "	7
Total ...	24·97 "	110	Total ...	21·75 "	117

TABLE III.

## WIND.

Days on which S.W. or. W. Wind was registered at 9 A.M.

1891.	S.W.	W.	1892.	S.W.	W.
			January... ..	9	3
			February... ..	7	6
			March... ..	4	2
			April... ..	5	4
			May... ..	8	10
June... ..	6	6	June... ..	8	13
July... ..	9	11	July... ..	2	9
August... ..	15	12	August... ..	14	4
September... ..	9	12	September... ..	8	12
October... ..	5	10	October... ..	3	8
November... ..	9	5	November... ..	10	2
December... ..	11	8	December... ..	2	7
Total... ..	64	64	Total... ..	80	80

In addition to these returns, a few important meteorological features, which have not been rigidly recorded, deserve our special attention :—

1. There is a very large amount of bright sunshine.
2. There are occasionally sea-fogs of very short duration, but never of any great density. (Compare statement at page 163 . . . Hurst Castle is about two miles from Milford-on-Sea.)

**Drainage.**—The new portion is very dry and well drained. All the houses are connected with a main sewer, which empties into tanks about three-quarters of a mile from the cliff—the effluent water running into the sea. The old village, on the other hand, is not well drained, as a portion has not yet been connected with the main sewer, the houses either having cesspools or draining direct into the stream. Until the drainage is completed, the old village must be regarded as a possible nucleus of infectious diseases dangerous to the new part; although, as a matter of fact, not a single case of scarlet fever, diphtheria, or typhoid fever has occurred in the village during the last four years.

**Water Supply.**—Both places are supplied with water from wells about 30 to 42 feet deep on the cliff, 5 to 20 feet deep in the



village; but an abundant supply of water has lately been found and will shortly be introduced by a local company.

**Prevalent Diseases.**—Phthisis is very rare. In the influenza epidemic, bad cases of bronchitis and pneumonia occurred; but only one of the former was fatal. Asthma is scarcely known, unless imported. There are many cases of anæmia, chiefly in servant girls; all recover. Eczema appears to be unknown here. A very severe outbreak of typhoid fever occurred in 1892, imported into a school by a pupil returning after the holidays. It spread to five other boys (in the same house only), in consequence of a drain leaking into the well supplying the drinking-water. There have been no other cases since; nor any of diphtheria or endemic sore throat. There has been one case only of scarlet fever during the past two years, although there was an epidemic within five miles.

Appended is a list of the cases (Table IV.) in which death certificates have been given during 1891-1892. Old age is of frequent occurrence, there being in the village many men over seventy, while one or two are over eighty.

During the five years 1887-1891 there were sixty-one persons buried in the parish church, the average age being forty-nine years. The population of the ecclesiastical district is over 1,000.

Table V. gives the number of deaths, and average age.

TABLE IV.

CAUSES OF DEATH IN MILFORD DURING 1891-1892.

Disease.	No. of Cases	Ages.	
		Yrs.	Yrs.
Typhoid ... ..	2	14	4
Senile Decay ... ..	1	90	...
"  "  Chronic Cystitis ...	1	71	...
"  "  Pneumonia ... ..	1	69	...
"  "  ... ..	1	82	...
Phthisis after Influenza ...	1	49	...
Œsophageal Obstruction ...	1	48	...
Meningitis ... ..	1	3	...
Bronchitis ... ..	2	60	3
Influenza—Syncope ... ..	1	50	...

TABLE V.

NUMBER OF PERSONS BURIED AT THE PARISH CHURCH, MILFORD.

—	Burials.	Average age of persons buried.
1887	14	59
1888	12	47
1889	8	35
1890	10	60
1891	17	47

**Therapeutic Effects and Uses.**—The special features of Milford-on-Sea as a health resort are marine influence, fresh pure air, abundant sunshine, a dry soil, and attractive scenery on every side. The New Forest, in the immediate neighbourhood, affords an endless variety of walks and drives, and the Isle of Wight can be readily visited *viâ* Lymington. A golf links on a beautiful position facing the sea, and yachting (to be had at Keyhaven, one mile from the Cliff), are other means of occupation for visitors.

This place promises to be a useful sanatorium for certain cases of tuberculosis, actual or threatened. It is also an excellent resort for convalescents after acute illness or operation. Several cases of this kind sent from London during the last few years have remarkably improved.

## SOUTHSEA.

Southsea consists of a comparatively modern extension of the town of Portsmouth towards the east. As a seaside resort it presents the striking feature of standing far back from the shore—a large tract of low, flat, common land lying between the houses and the beach. Its marine exposure is due south towards Spithead and the eastern extremity of the Isle of Wight.

The situation is open on the east to the Channel; from the north it is protected by the great Portsdown range in the rear; and the force of southerly, south-westerly, and westerly winds must be considerably broken by Portsmouth and Gosport in the



neighbourhood, and by the Isle of Wight and the New Forest in the distance. Built as it is on the Island of Portsea, Southsea stands almost on the sea-level, and indeed part of it is said to lie below high-water mark.

Whilst the houses are some distance from the shore, inhabitants and visitors can enjoy the full influence of the sea upon the Common, which is a favourite resort, and on the promenade by the shore for a distance of two miles. There are also two piers, and steamers are constantly running to the Isle of Wight and Southampton. The beach is shingly, and the bathing here is considered good, though somewhat cold. The accommodation provided for visitors to Southsea is superior to the ordinary type of seaside hotels and lodging-houses.

**Geology and Soil.**—The soil is that of the middle eocene, as described in the second district of Hampshire (p. 159). The subsoil is gravel.

**Vegetation.**—There is an abundant growth of grass on the Common and of occasional trees, shrubs and flowers in the gardens; otherwise vegetation is not a prominent feature at Southsea—partly a result, no doubt, of the military exigencies of the fortress town.

**Meteorology.**—The meteorology of Portsmouth for the ten years 1881–1890 is set forth in tabular form on p. 161, and the figures are analysed and discussed on pp. 162, 163.

The relative humidity is high in winter, and Portsmouth is generally regarded as being damp, although not foggy.

**Drainage and Water Supply.**—Southsea is thoroughly well drained, and strict attention is paid to the sanitation of individual houses. The water supply is copious and pure.

**Prevalence of Disease.**—The tables on the following page present the returns of the Medical Officer of Health for Portsmouth for 1893, as far as they relate to Southsea. No disease is specially prevalent. The death-rate for 1894 was 12·16.

**Therapeutic Effects and Uses.**—Southsea is one of the most favourite towns on the South Coast, particularly with two classes of people—with the families of retired officers of the Navy and Army as a place of residence, and with yachtsmen as a fashionable resort in the season.

The former find in its mild climate, in its situation, in the sights and incidents of the great dockyard and garrison, and in its

TABLE I.

TABLE OF DEATHS DURING THE YEAR 1893 IN THE URBAN SANITARY SUB-DISTRICT OF SOUTHSEA, CLASSIFIED ACCORDING TO DISEASES, AGES, AND LOCALITIES.

[illegible]

TABLE II.

TABLE OF POPULATION, BIRTHS, AND OF NEW CASES OF INFECTIOUS SICKNESS, COMING TO THE KNOWLEDGE OF THE MEDICAL OFFICER OF HEALTH, DURING THE YEAR 1893, IN THE URBAN SANITARY SUB-DISTRICT OF SOUTHSEA, CLASSIFIED ACCORDING TO DISEASES, AGES, AND LOCALITIES.

POPULATION AT ALL AGES.		Registered Births.	Aged under 5 or over 5.	NEW CASES OF SICKNESS IN EACH LOCALITY, COMING TO THE KNOWLEDGE OF THE MEDICAL OFFICER OF HEALTH.										
Estimated to middle of 1893.				Smallpox.	Scarlatina.	Diphtheria.	Membranous Group.	FEVERS.					Cholera.	Erysipelas.
								Typhus.	Enteric or Typhoid.	Continued.	Relapsing.	Puerperal.		
13,798	640	Under 5.....	...	25	2	...	...	...	...	...	...	...	1	
		5 upwards ...	...	57	9	...	...	16	...	...	2	...	1	



society, peculiarly congenial surroundings. Of the 167,285 inhabitants of Portsmouth, no less than 8,076 are classed in the last census returns under the head of "Retired or unoccupied classes living on own means, including pensioners"; and it is believed that with a very few exceptions the whole of these live in Southsea, which has but a total population of 13,798.

The Solent is very convenient for boating and yachting.

Southsea is also largely frequented by the general public in summer, at which time the population is said to be nearly doubled. In addition to the ordinary attractions of the coast, the advantages to be enjoyed here are the great, open, breezy Common, within the full influence of the sea, unequalled opportunities for sea-trips of great variety, the proximity of the Isle of Wight, and the many novel and popular interests connected with the dock-yard, arsenal, and fortifications. As a place for convalescents Southsea has also earned a considerable reputation, and many delicate persons, including the subjects of chronic lung disease, winter here with safety and advantage.

The Committee desires to thank Dr. Mumby—Medical Officer of Health for Portsmouth—and Drs. Blackman and Hill for kind help afforded by them in the preparation of this report.

#### THE ISLE OF WIGHT.

The Isle of Wight owes its peculiar climatological features, first, to its geographical position; and, secondly, to its physical and geological characters.

On the north it is separated from the coast of Hampshire by the Solent, a sea channel some three or four miles wide; on its south-western, southern, and south-eastern sides it is fully exposed to the English Channel, with all the marine influences of the Atlantic, including part of the Gulf Stream.

Geologically the island is composed of two entirely different or distinct portions, of nearly equal area, the one on the north, the other on the south, of a great range of chalk downs running from the Needles on the west to the Culvers on the east shore.

The northern portion belongs geologically to the upper eocene

beds of the region of the New Forest, which have been already described in the sketch of Hampshire, and which lie above the chalk. The rivers here flow north, each with a short course and a wide muddy estuary on a flat shore, like the Lymington, Beaulieu, and other streams on the opposite coast. The land is relatively low-lying, but pleasingly undulating and broken by the river beds, and well timbered—particularly on the east.

The southern portion of the island belongs to the older geological formation of Surrey and Sussex—the chalk and the upper and lower greensand. The chalk remains in the great median range of downs just described, and in a second much shorter and higher range, running from St. Catherine's Hill to Shanklin Down, behind the Undercliff. Over the rest of the region the older strata of the greensand and gault are exposed. The whole of this area is more or less elevated, rising into heights of from 200 to 800 feet; its coast lines are formed of precipitous cliffs, broken by occasional chines; its streams are insignificant. Where exposed to the full force of the south-west wind, the downs are bare and treeless; but further inland, and with favourable disposition of the land as regards local shelter, there is abundance of wood, and vegetation is luxuriant. The Undercliff presents features so peculiar to itself that it will be specially described along with Ventnor.

In connection with the physical characters, and their influence on the climate, of the two portions of the Isle of Wight, it has next to be observed that the prevailing and stronger winds are from the west and south-west. The north side of the island is thus more sheltered than the south side; but on the other hand the former has a less warm and a damper atmosphere than the latter in winter, and a hotter atmosphere in summer.

**Climatology.**—The actual figures of the records of the meteorological conditions of the Isle of Wight are given in the special sections of this report on Ventnor, Sandown, and Cowes (Osborne). In a general account of the climatology of the island as a whole it will be more profitable to present the following brief analysis of the tables and certain deductions from them:—

(1) The climate is *marine*. It is humid; the air is pure, rich in ozone, and bearing traces of saline constituents; fogs, when they do occur, are sea-fogs, not land-damp.



(2) The climate is *absolutely mild in winter*. The mean temperature of Ventnor at 9 a.m. for the six winter months, October to March, is  $44.566^{\circ}$ , whilst that of London is only  $41.066^{\circ}$ . Similarly, the mean maximum temperature during the same period is higher at Ventnor than in London by  $2.24$  degrees.

(3) It is fairly *equable*: it is *relatively* warm in winter and cool in summer. The mean minimum winter temperature of Ventnor is  $40.26^{\circ}$ , the mean maximum summer temperature  $62.90^{\circ}$ —a mean seasonal range of  $22.64$  degrees: those of London are  $36.36^{\circ}$  and  $65.06^{\circ}$  respectively—a mean seasonal range of no less than  $28.7$  degrees. It is also equable as regards the daily range of temperature. This, for example, is  $8.3$  degrees at Ventnor in January, instead of  $9.1$  at London; and, again, only  $12.1$  degrees at Ventnor in August, instead of  $17.1$  degrees at London.

(4) It is on the whole *breezy*. The prevailing wind, as already mentioned, is from the south-west, a fact demonstrated by the inclination of many of the trees. This is a purely sea breeze, mild in winter, but with a cooling effect in summer, frequently moisture-laden, and occasionally high and rough. All the influences of this wind are necessarily most felt on the southern portion of the island. Northerly winds, after reaching the northern portion of the island, encounter the long range of chalk downs, which must mitigate their violence before they affect the parts beyond; and the Undercliff is further sheltered from them by the second screen of hills immediately above it. Easterly winds are intermediate in frequency between westerly and northerly winds. They blow particularly in the late winter and early spring, and are often severe and trying.

(5) The climate is *varied*—that is, it is different in different parts of the island. This feature has been already indicated under previous heads. Mention must, however, also be made of differences of climate referable to variety of local shelter afforded by the many downs—particularly those behind the Undercliff; of the effect of the central position, as opposed to the purely marine situation, of certain places of resort; of the east as contrasted with the west extremity of the island, the former being much more heavily wooded and much less disturbed by wind than the latter, particularly Freshwater; and of the nature of the soil,

which is, as a whole, drier and warmer on the chalk and greensand than on the more recent deposits of the north side.

**Therapeutic Effects and Uses.**—The Isle of Wight deserves the reputation which it has long enjoyed as a part of the country where a mildly bracing or tonic sea influence can be obtained at every season of the year. It is much employed for promoting recovery during convalescence from acute disease and after operations; more particularly in winter, but also—from the equability of its climate—in the other months of the year. Many classes of delicate persons are sent here with benefit: weakly scrofulous children, former residents in the tropics, adolescents with threatening or incipient tuberculosis of the lungs, old people, and that large and heterogeneous group of individuals who, although structurally sound, cannot maintain their health excepting under specially favourable climatic conditions.

Whilst patients belonging to these different classes may be advised to try the climate of the Isle of Wight, their medical attendant must make a point of being more explicit in his recommendation. He must bear in mind one of the features of this climate to which special attention has just been drawn, namely, its *variety*. In no instance should a patient be sent in so many words to "the Isle of Wight." The portion of the island which he is to visit must always be definitely named to him. The foregoing facts and conclusions may serve to help the practitioner somewhat in making a selection; and the special characters of the individual health resorts may be gathered from the following sections. The more feeble, delicate or debilitated patients will proceed to the Undercliff, particularly during the winter. The somewhat more robust, and especially the younger subjects, will be able to bear with positive advantage the more bracing climates of Shanklin and Sandown on the east, at any rate during the warmer seasons of the year. Those persons who desire to secure simply the benefits that are looked for from a refreshing change to the coast during the hot weather will select either Shanklin, Sandown, or Freshwater, where bathing can be obtained, or the northern shore of the island, where they will be in a better position to avail themselves of the advantages of excursions on the sea which are abundantly provided at Cowes and Ryde.



## VENTNOR AND THE UNDERCLIFF.

Ventnor, a small town of some 6,000 inhabitants, is situated near the southern extremity of the Isle of Wight towards the eastern end of the Undercliff, a narrow stretch of broken, terraced land which extends between Luccomb Bay on the east and Blackgang Chine on the west—a distance of some six or seven miles. As its name suggests, the Undercliff lies between the sea—the Channel—in front and the cliff behind, the cliff being indeed the precipitous face of great downs that rise to a height of from 400 to 800 feet above the sea. It is of slips from the face of these hills, consequent on the peculiar geological conformation of the soil, that the Undercliff is formed; and it is on the slips, and on a series of irregular rocky terraces formed or left by the slips, that Ventnor is built, street above street. Lying in a shallow recess, the houses of the town stretch from the beach to a height of nearly 500 feet, clinging to the great cliff, and with a variety of aspect, though mainly facing the south. One of the most striking features of Ventnor is the precipitous steepness of many of the streets. Those which run from east to west present local acclivities; those which run from the beach to the higher parts of the town have had to be constructed in long zig-zag slopes along the face of the rock.

The aspect of the Undercliff, including Ventnor, is in general due south; its eastern extremity however has a south-eastern exposure; its western extremity faces the south-west. The disposition of the parts which have been described insures complete shelter of the Undercliff from all northerly and north-easterly winter winds by the lofty line of downs—particularly St. Boniface and Rew Downs behind Ventnor, and St. Catherine's Down behind Blackgang Chine on the extreme west. To the east of Ventnor the high land abuts directly on the sea as the bold promontory of Dunnose, which shelters the town from that quarter, Bonchurch being particularly well protected. Ventnor is fully exposed to the south and south-east winds. From the west and south-west winds, more prevalent in summer, it is protected by local spurs of the cliff and irregularities of the surface. In spite of this shelter, the wind is sufficient in dry weather to raise great clouds of gray dust, formed of the light sandstone soil, along the

narrow Undercliff road, annoying the traveller. In the upper parts of the town most of the houses stand in their own gardens; but in other parts some of them look small and stuffy.

**Geological Formation; Soil; Vegetation as evidence of Climate and Protection.**—The geological formation of the land at Ventnor belongs to that which is characteristic of the south side of the Isle of Wight, already described, and is of great interest in connection with the origin of the Undercliff, as well as with the nature of the surface and of the soil. The surface of the downs consists of chalk marl, chalk, and upper greensand, disposed almost horizontally, but with a slight dip towards the sea. Beneath these lie greensand, gault, and ferruginous sand. When the springs act upon this marl, mud is formed, and the upper strata of land slip forward and fall from the cliff in the form of great masses of soft sandstone and chalky earth. It is by this process of landslips that the terraces of the Undercliff itself have been found; and it is of the detritus of these mixed fallen masses that the soil of the place mainly consists—a soil which as a whole is absorbent and dry, and well-drained by the disposition of the deeper strata, but one which readily forms an abundance of light irritating dust in fine weather, as we have just seen, and yields an objectionable mud after continuous wet.

The vegetation of the Undercliff is luxuriant, and of a character strongly suggestive of general mildness of climate, warmth, and shelter from the north. The evidences of spring are very early here: many tender shrubs and garden plants blossom throughout the winter along the Undercliff; and trees and hedgerows attain a size and figure unusual on the very margin of the sea. By means of the abundant vegetation further local protection is secured from the easterly and south-westerly winds.

**The Sea.**—Next to its picturesque situation, the most striking feature of Ventnor is the sea—a great brilliant mirror, reflecting, in fine weather, the light and heat of the sun against the cliff and town. On the beach, a fringe of sand which affords good bathing in beautiful clear water, the full influence of the sea is felt. Here there is an esplanade, with a handsome pier. Along the Undercliff towards the west the road recedes from the beach; and here—where it skirts the foot of the landward cliff, and is surrounded by abundant vegetation—the traveller misses the usual freshness



of a marine climate. The Undercliff lies within the influence of that part of the Gulf Stream which sweeps along the English Channel from west to east. No doubt this circumstance contributes to the mildness of its winter and climate.

**Climate and Meteorology.**—Ventnor is one of the stations of the Royal Meteorological Society, and the records required for forming an estimate of its meteorology and climate generally may be regarded as complete.

The Tables I. and II. on the following page are taken from records in the *Quarterly Journal*. An analysis of these and other tables reveals some noteworthy facts.

(1) The mean temperature for the whole year at 9 A.M. is  $51\cdot0^{\circ}$ —a temperature exceeded by but  $\cdot3$  degrees by that of Guernsey, and by  $\cdot4^{\circ}$  by that of Bournemouth

(2) The mean temperature at 9 A.M. for the six months, October to March inclusive, is  $44\cdot566^{\circ}$ , as compared with  $41\cdot066^{\circ}$  at Regent's Park.

(2a) The mean temperature at 9 A.M. for the six months, April to September inclusive, is  $57\cdot45^{\circ}$ , as compared with  $56\cdot65^{\circ}$  at Regent's Park.

(3) The mean minimum temperature for the whole year is  $45\cdot5^{\circ}$ —a temperature exceeded only by Ilfracombe,  $46\cdot9^{\circ}$ , Guernsey,  $46\cdot9^{\circ}$ , and Falmouth,  $45\cdot9^{\circ}$ .

(4) The mean maximum temperature for the whole year is  $56\cdot1^{\circ}$ , the same as that of Guernsey and that of Regent's Park; and exceeded by those of no fewer than eight stations, inland and marine.

(5) The mean maximum summer temperatures are as follows, compared with those of Regent's Park :

	June	July	August
Regent's Park . . . .	68·1	71·0	70·0
Ventnor . . . . .	64·8	67·0	67·9

—showing a comparative coolness of the air at Ventnor in summer by two to four degrees.

(6) The mean maximum temperature for the six winter months,

TABLE I.

MEANS FOR TEN YEARS, 1881-90.—QUARTERLY AND YEARLY.

Station, VENTNOR, ISLE OF WIGHT. Height above Mean Sea Level, 80 feet.

J. CODLING, H. SAGAR, and H. CLEELAND, Observers.

QUARTERS AND YEAR.	TEMPERATURE OF AIR.			Mean Temperature of Air.	Mean Relative Humidity, 9 a.m.	Amount of Sunshine.	Mean Cloud, 9 a.m.	RAIN.	
	Mean of Highest.	Mean of Lowest.	Mean Daily Range					Days it fell.	Inches.
	°	°	°	°	%	hrs.			
Jan.—March ...	46·8	37·6	9·2	42·2	85	<sup>1</sup> 255	6·4	42	6·38
April—June ...	59·3	46·7	12·6	53·0	78	568	5·7	34	5·20
July—Sept. ...	66·5	54·9	11·6	60·7	78	584	5·8	40	6·71
Oct.—Dec. ...	51·8	43·0	8·8	47·4	84	231	6·5	48	9·84
Whole year ...	56·1	45·5	10·6	50·8	81	1638	6·1	164	28·13

<sup>1</sup> The sunshine observations were made at St. Lawrence, near Ventnor.

TABLE II.

MONTHLY MEANS FOR TEN YEARS, 1881-90.

Station, VENTNOR, ISLE OF WIGHT. Height above Mean Sea Level, 80 feet.

J. CODLING, H. SAGAR, and H. CLEELAND, Observers.

MONTH.	TEMPERATURE OF AIR IN MONTH.			Mean Temperature of Air in Month.	Mean Relative Humidity, 9 a.m.	Amount of Sunshine.	Mean Cloud, 9 a.m.	RAIN.	
	Mean of Highest.	Mean of Lowest.	Mean Daily Range.					Days it fell.	Inches.
	°	°	°	°	%	<sup>1</sup> hrs.			
January ...	45·7	37·4	8·3	41·6	88	53	6·8	16	2·60
February ...	46·1	37·7	8·4	41·9	86	76	6·6	13	2·00
March ...	48·6	37·6	11·0	43·1	81	126	5·9	13	1·78
April ...	53·4	41·2	12·2	47·3	79	182	5·8	12	1·71
May ...	59·6	47·1	12·5	53·3	77	200	5·5	12	1·83
June ...	64·8	51·8	13·0	58·3	78	186	5·7	10	1·66
July ...	67·0	55·3	11·7	61·2	79	199	6·1	14	2·41
August ...	67·9	55·8	12·1	61·8	76	210	5·4	13	1·72
September ...	64·6	53·7	10·9	59·1	80	175	5·8	13	2·58
October ...	57·2	47·0	10·2	52·1	80	129	6·0	15	3·56
November ...	51·9	43·7	8·2	47·8	85	51	6·7	18	3·48
December ...	46·4	38·2	8·2	42·3	86	51	6·7	15	2·80

<sup>1</sup> The sunshine observations were made at St. Lawrence, near Ventnor.



October to March inclusive, is  $49.30^{\circ}$ , as compared with  $47.06^{\circ}$  at Regent's Park, distributed as follows:

	October	November	December	January	February	March
Regent's Park . . . .	55.2	49.2	42.9	42.9	44.1	48.1
Ventnor . . . . .	57.2	51.9	46.4	45.7	46.1	48.6

—showing a comparative warmth of the air in winter in favour of Ventnor by two to nearly three (mean 2.24) degrees.

(7) The mean temperature for the year is  $50.8^{\circ}$ ; which is  $.2^{\circ}$  higher than that of Falmouth, and is exceeded only by that of Guernsey ( $51.5^{\circ}$ ) and that of Ilfracombe ( $51.1^{\circ}$ ).

(8) The mean relative humidity at 9 A.M. for the year is eighty-one per cent, which is the same as that of Regent's Park, and exceeds that of but seven stations in the kingdom, including Bournemouth, Norwood, Brighton, and Weymouth.

(9) The mean relative humidity at 9 A.M. for the six winter months, October to March inclusive, is  $84.3$ , which is  $2.3$  less than that of Regent's Park for the same winter months.

(10) The mean amount of cloud (0 to 10) at 9 A.M. for the year is  $6.1$ . Only three stations have less cloud (*i.e.* are brighter), namely, Weymouth ( $5.4$ ), Worthing ( $5.9$ ), and Portsmouth ( $6.0$ ).

(11) The mean amount of cloud for the six winter months, October to March inclusive, is  $6.41$ , as compared with Weymouth  $6.06$ , and Worthing  $6.21$ .

(12) The mean total rainfall for the year is  $28.13$  inches—nearly three inches more than at Regent's Park.

(13) The mean total rainfall for the six winter months, October to March inclusive, is  $16.22$  inches, as compared with  $12.33$  at Regent's Park.

(14) The mean number of rainy days (0.01 inch and upwards) per annum is 164, almost exactly the same as at Regent's Park (165), and one of the most favourable results in the kingdom.

(15) The mean number of rainy days during the six winter months, October to March inclusive, is 90, against 91 at Regent's Park.

*Wind.*—Ventnor is a stormy place, being often swept by south-westerly gales. The prevailing winds and the amount and

character of local shelter have already been referred to in the present section and in the general description of the Isle of Wight. The following is the official return with respect to winds:

PREVAILING WINDS.	Winter.	Spring.	Summer.	Autumn.
Westerly and South-Westerly . .	48	57	73	44
Easterly and South-Easterly . .	42	35	15	47

*Sunshine.*—Ventnor enjoys a large amount of bright sunshine, as the following table shows:—

HOURS OF BRIGHT SUNSHINE AS RECORDED IN THE "METEOROLOGICAL JOURNAL" FOR THE YEARS 1881—1889.

Place	1881	1882	1883	1884	1885	1886	1887	1888	1889	Mean
Ventnor . .	1605	1709	1694	1561	1704	1683	1902	1448	1495	1644.5
Kew . . .	1451	1444	1484	1318	1480	1431	1592	1159	1205	1395.7
Greenwich. .	*	*	1241	1115	*	1228	1401	1068	1155	1201.3
Bournemouth	1701	1736	1647	1406	1524	1538	1822	1328	1292	1477.1
Llandudno .	*	1255	*	*	*	1204	1376	1210	1030	1219.0
Blackpool. .	*	1376	*	1190	*	1239	1596	1173	1307	1313.3
Eastbourne .	*	*	*	*	*	1665	1829	1461	1526	1620.1

\* Not recorded.

When we review these results, we find that the climate of Ventnor, as far as it depends on weather, is:—

(1) Relatively mild in winter; (2) Relatively cool in summer; (3) Equable; (4) Bright; (5) Of comparatively low relative humidity; (6) Fairly wet as regards rainfall, but with relatively few rainy days.

**Sanitation, Drainage, and Water Supply.**—Ventnor is thoroughly drained by a main sewer with outfall into the sea. The street sewers are ventilated and flushed.

It is supplied on the "intermittent" principle with water collected from springs in St. Boniface Downs on the north, high above the town. The water is pure, but very hard from suspended chalk.

**Health, Mortality, and Prevalence of Diseases.**—The death-rate of Ventnor, according to the latest official information, is 17.6. This figure relates to the total or gross mortality of the place; and on the same authority we learn that the true mortality of Ventnor—that is, amongst the inhabitants proper,



excluding visitors—amounts only to 7·6 per 1000. The zymotic death-rate is 0·9 per 1000. During the year 1893, forty cases of infectious disease were notified under the Act.

**Prevailing Diseases.**—Dr. Coghill and Dr. Williamson have kindly furnished the Committee with much valuable information on this subject and on the features and value of Ventnor generally. The interest shown by Drs. Robertson, Whitehead, and Woodford in the present enquiry is also gratefully acknowledged.

Anæmia is very common among residents. It yields readily to iron, but is recurrent; it also rapidly yields to treatment in the case of visitors, with and without iron.

Debility after acute disease in the inhabitants requires change from Ventnor.

*Phthisis, including Hæmoptysis.*—Pulmonary tuberculosis appears to be less frequent among residents at Ventnor than in England generally; but it is practically impossible to state the difference in figures. As Dr. Ogle has pointed out, a number of consumptives, finding Ventnor suitable, settle permanently in it, and, by dying here, swell the local mortality from phthisis.

The facts bearing on the effects of the climate of Ventnor on pulmonary tuberculosis are of quite exceptional value. In the first place, they are very numerous; secondly, they relate to patients of every class; and, thirdly, the majority of the local observations at our disposal have been made with an exactness and completeness which can be attained only in a hospital—in this instance in the Royal National Hospital for Consumption and Diseases of the Chest. Dr. J. M. Williamson, one of the surgeons, having access to the records of the institution, has published<sup>1</sup> the following table of results in 542 cases under treatment—some for several consecutive years, none for less than ten weeks:—

Disease unchecked . . . . .	73	Improved . . . . .	101
Decidedly worse . . . . .	40	Much improved . . . . .	118
Died . . . . .	28	Very greatly improved . . . . .	123
		Amendment equivalent to restoration	50
Number who underwent no improvement . . . . .	141	Number who underwent improvement	401
		(or 73·39 per cent.)	

Dr. C. Theodore Williams's results agree remarkably with the preceding. Of 58 patients, each of whom spent an average of 1·36

<sup>1</sup> *Ventnor and the Undercliff in Chronic Pulmonary Diseases*, 1884.

winters at Ventnor, 40 improved (nearly 69 per cent.), 4 were stationary, and 14 were worse.<sup>1</sup>

With regard to the class of cases that improved, there is necessarily less certainty. It may be safely stated, however, that incipient cases benefited most, and indeed very considerably; that the lower the fever and the less pronounced the cachexia, the more favourable were they; and that cases of phthisis once arrested, or previously arrested, do well here. Whilst hæmoptysis is not more frequent here than elsewhere, cases of the distinctly hæmorrhagic type of the disease appear to be actually injured by Ventnor. The place also does not agree with very advanced cases, nor] with laryngeal cases excepting in the early stage; and the air is not sufficiently sedative for patients with hard, irritable, dry cough, although more soothing in this respect than certain other places on the south coast. On the other hand, the liability to acute bronchitis, pneumonia, and pleurisy appears to be diminished by this climate; and even intestinal complications are said to improve.

Scrofula and local tuberculosis other than pulmonary phthisis are rare amongst residents here. In every form they are markedly benefited by Ventnor.

Bronchitis and catarrh are fairly common at Ventnor, but of a comparatively mild type. Chronic bronchitis is uncommon amongst residents. Visitors suffering from it derive much benefit, especially if they select the higher part of the town.

Pneumonia is somewhat common here.

Pleurisy with effusion appears to be infrequent. Visitors with chronic pleurisy and retracted side regain vigour and lose local distress. Cases of chronic empyema with internal or external fistula have improved in general health on their arrival at Ventnor; after a period of residence the discharges have diminished, and in some instances ceased.

Asthma is uncommon in residents. Of asthmatical visitors the majority improve, many being entirely free from attacks whilst they remain here. Cases of asthma are occasionally met with which are aggravated or relieved, respectively, by changing the situation of their apartments above the sea—an easy matter at

<sup>1</sup> *The Influence of Climate in the Prevention and Treatment of Pulmonary Consumption*, 1877, p. 57.



Ventnor, where houses are to be had at all elevations from 20 to 400 feet above the level of the Channel.

It has also been observed that of asthmatics those are most likely to be benefited by Ventnor who suffer severely in towns, and those with a largely bronchitic element in their disease. On the contrary, women, particularly if the subjects of chronic uterine disorders, and neurotic subjects generally, obtain less benefit here, or, it may be, suffer more.

Acute renal dropsy and chronic Bright's disease present no special feature at Ventnor, unless it be that bronchial complications may be less common than elsewhere. Chronic cases are favourably affected by residence.

Calculus and gravel are very rare; but in connection with a tendency to these complaints, the very hard character of the water ought not to be forgotten.

Rheumatism is not uncommon at Ventnor; but, on the whole, it is of a subacute type, and less frequent here than in other parts of the island to the north of the downs.

The subjects of chronic rheumatism and rheumatoid arthritis, and persons suffering from atonic gout, who bear cold badly, improve in general health by wintering here. The comfort enjoyed has been referred in part to the relative warmth of the nights between sunset and sunrise, probably due to the insular position of Ventnor.

Neuralgia is a very common complaint at Ventnor, apparently in association with the prevalent anæmia.

Eczema is believed not to do well at Ventnor.

Lupus, on the contrary, sometimes improves to a marked degree.

Malaria does not occur amongst the inhabitants of Ventnor. Visitors who have suffered from malaria in the East, and after return to colder parts of the kingdom, have entirely lost their attacks here. A number of people have settled in Ventnor who had spent their early years in the tropics, and had suffered not only from malaria, but from splenic, hepatic, and dysenteric disease. At the same time it ought to be observed that some of these subjects are liable to develop neuralgia unless guarded against anæmia.

Typhoid fever has almost disappeared from Ventnor since the town was systematically drained and otherwise improved.

Diarrhœa is not troublesome, even in summer. Many cases of chronic tropical diarrhœa have improved remarkably here, apparently in consequence of the local climate.

Scarlet fever has been frequently imported into Ventnor, but has rarely spread to any extent; indeed, it appears not to have become epidemic here during the last fifty years.

Diphtheria never prevails: it is both rare and sporadic only.

Endemic sore-throat is not recognised.

**Therapeutic Effects and Uses.**—If we now inquire which of the many facts collected with respect to the climatology of Ventnor are to be regarded as distinct features of the place supplying definite therapeutical indications, we find that they are mainly the following:—(1) Its unique situation in the extreme south of England with full exposure to the sun and sea, and protection from the north, north-east, and east; (2) its dry, warm, and well drained soil; (3) the favourable climate which it enjoys—mild in winter, equable, very bright, and dry, there being but few days so inclement as to keep invalids indoors forenoon and afternoon; (4) the thoroughly marine nature of all the influences—near the place as well as in it—that is, during all kinds of exercise and excursions; (5) the abundant opportunity of healthful exercise afforded to more robust visitors by the downs; (6) a perfectly salubrious and sanitary place of residence; and lastly—a feature which is sometimes forgotten—the great range of altitude in the situation of the different terraces above the sea, which enables dyspeptic and still more asthmatic patients to try a variety of heights until they find one that suits them.

Side by side with these features of Ventnor, all more or less favourable, have to be placed a few considerations of the nature of drawbacks:—(1) The very completeness of shelter from colder winds, and the full southern exposure of its abrupt and lofty cliff-front to the brilliant sun and sea, combine to produce in some seasons, on some visitors, a sense of heat and closeness, which is not sufficiently mitigated by the mild sea-breezes on the terraces. (2) The steepness of many of the streets makes them altogether unfit for invalids with serious lung disease, unless the invalids consent to be wheeled about; and healthful outdoor exercise in the higher, more bracing, parts of the town must be curtailed from this circumstance in the case of tuberculous subjects. Feebler



persons, it is true, can walk on the shore level and along by the undercliff, but this road is frequently "close" and dusty in spring and summer when disturbed by wind or traffic.

The physiological effects of Ventnor, in addition to those common to marine situations in general, have been ascertained to be important. It is sedative to the nervous system, producing a sense of rest, which is accompanied by a tonic effect in the higher part of the town, possibly by a depressing effect near the shore; and is said to be remarkably beneficial in "nervous dyspepsia." Delicate but healthy children, girls at puberty, and aged persons thrive satisfactorily here.

Under the combined influences of a favourable kind which have just been reviewed, the chronic invalid is enabled to maintain comparative health.

It is, however, in the treatment of disease of the lungs that Ventnor and the Undercliff as a whole have been most employed, and have proved themselves most useful. The value of this climate in pulmonary tuberculosis generally, and in the different types and stages and complications of this disease, has been sufficiently set forth in an earlier part of our report. In this connection it may be mentioned that the insular situation of Ventnor, with the necessary "passage" across the Solent and double railway journey, no doubt militates against the selection of it as a resort for feebler consumptives. The Undercliff is one of the best places in the kingdom for scrofulous children.

The risk of recommending Ventnor as a favourable climate for cases of asthma (a considerable risk in respect of every health resort in this very variable and uncertain disease) may be undertaken by the physician with less hesitation, if he remember that the effects of the place on asthmatics vary with the altitude of the different terraces above the sea, the heights usually proving more suitable than the shore and lower terraces. But, as a whole, the results of the treatment of asthma at Ventnor are not very encouraging.

Patients suffering from disease of the heart ought not to be sent to Ventnor without careful consideration of the steepness of the streets and difficulty of finding level walks of any considerable length.

Lastly, Ventnor is a charming sea-side resort in summer for

healthy persons, whether from town or from the inland parts of the country. In recommending it to their ordinary patients, practitioners will do well to bear in mind not only the various points connected with it, to which special attention has already been drawn, but also that constipation is so general amongst visitors to it that persons who suffer from severe habitual constipation ought not to visit it; that neuralgia is often aggravated by this climate—at least in plethoric individuals; that eczema may also increase here, particularly on the shore; and that the drinking water is so hard that it may possibly increase the liability to calculus in predisposed persons.

#### SHANKLIN.

Shanklin is a bright, breezy little town, of 4,000 inhabitants, picturesquely situated on a shallow indentation of the coast-line of Sandown Bay, a short distance to the north of the south-eastern angle of the Isle of Wight. The aspect of the place is due east. It is built partly on the shore and partly on the cliff, whence it is extending inland towards the downs. In consequence of this variety of situation, Shanklin possesses three distinct climates—determined by the sea, the cliff, and the downs respectively. The best part of the town is built upon the cliff; and the houses are good, or at least very fair. Much of the town is sheltered by the natural slope of the land towards the shore, and by the great downs to the south; and Shanklin Chine, a picturesque glen 450 feet long, running from the beach into the land, is abundantly wooded. The dark-brown cliff, very lofty and precipitous, protects the shore from the high south-westerly winds.

**Geological Formation and Soil.**—Most of Shanklin stands on the lower greensand; and the soil is dry. It has also the full advantage of natural drainage.

**The Sea.**—The beach is sandy and firm; the bathing good and safe. The Esplanade pier, 1,180 feet in length, affords a sheltered promenade.

**Meteorology.**—Unfortunately no records on this subject are available.

**Drainage.**—Shanklin possesses a complete system of sewerage, with outfall into the sea on the Sandown side of the bay.



**The Water Supply** is good, from the high downs behind the town; but it is insufficient, and the system includes storage in reservoirs.

**Prevalence of Diseases. Mortality. Common Causes of Death.**—Drs. Dabbs and Cowper deserve the special thanks of the Committee for furnishing useful information on these and allied subjects relating to Shanklin.

Anæmia is very prevalent among the inhabitants—more so on the cliff and near the shore than where the air from the downs prevails. Girl visitors often complain after a time of amenorrhœa.

Scrofula and tuberculous diseases, other than phthisis, are of rare occurrence in the population, particularly tuberculosis of bones. Cases of this kind, and of scrofulous glands, sent from different parts of the country to Scio House Surgical Home have benefited remarkably by the climate of Shanklin, some being cured and others improved, and none having died. Pulmonary tuberculosis is not common in the inhabitants. Early cases of the disease sent here are favourably affected by the change; not so cases that are advanced, nor cases complicated with hæmoptysis, which do badly.

Bronchitis and catarrh are of average frequency, but not severe. Pneumonia (a notified disease in Shanklin) is very rare. The same may be said of asthma. Pleurisy was more common recently, following influenza.

Acute and chronic renal disease, and calculus and gravel, are all regarded as very rare at Shanklin.

Rheumatism and neuralgia are common, and are aggravated by the influence of the shore as contrasted with that of the downs.

Eczema is frequent, but is said to yield readily to treatment.

Malaria is unknown as an endemic disease. Only two cases of typhoid commenced here during the last ten years. Diarrhœa is of ordinary frequency, in spring and autumn. Scarlet fever is very rare. Of diphtheria only four cases have occurred in eight years, of which two cases were imported. Endemic sore throat is practically unknown.

The common causes of death, besides old age, are chest affections, including imported phthisis.

The death-rate is twelve to fourteen per thousand. Old age is frequent.

**Therapeutic Effects and Uses.**—Shanklin is a favourite seaside resort for town and country people in the summer months, when its population is doubled, and most of the advantages afforded by the coast may be fully enjoyed, particularly bathing. As a climatological station for the treatment of debility and disease, it is of chief value in the case of delicate children, who benefit greatly by residence here all the year round, especially those who suffer from tuberculosis of glands and bones. In the spring, summer, and autumn months it is also a good place for invalids with chest disease, provided they are able to take at least moderate exercise, for the air is bracing, and sometimes really cold when the wind is from the east.

It is said that cases of mental derangement with excitement do well at Shanklin—not melancholics.

The variety of climate presented by Shanklin must not be forgotten in recommending patients to visit it; a change from the shore to the cliff or downs, or *vice versa*, being frequently attended with unmistakable effects of a beneficial kind.

#### SANDOWN.

Sandown is a small town of about 3,500 inhabitants, but accommodating 3,000 visitors in the course of each year. It is situated towards the northern end of the bay of the same name, which stretches from Dunnose Head on the south to Culver Cliff on the north-east and occupies a great part of the south-eastern coast of the Isle of Wight. The marine exposure of the town is south-east. Approaching Sandown from Shanklin, the land falls away here both towards the sea and towards a tract of marsh land on the north, by the disappearance of the great cliff; and on these slopes Sandown is built. The most striking feature of its situation, as compared with other places in the neighbourhood, is its openness both to sea and to land: the absence of sheltering downs and overhanging cliff or chine, and even of trees in any number. It is thus exposed to the winds, especially the winds from the south-west and east, which are occasionally very high.



**Geological Formation and Soil.**—The greater part of Sandown is built on a subsoil of wealden clay; but the upper portion of the town stands on the lower greensand, which is of great depth at the highest point.

Whilst trees are very few, or but recently planted, the gardens are filled with an abundant vegetation, which testifies to the comparative mildness of the winter climate. The rose, mignonette, marigold, stock, forget-me-not, pansy, geranium, anemone, periwinkle, hepatica, yellow jessamine, polyanthus, and primrose have been found blooming together out of doors on the 1st of January; and the magnolia, fuchsia and eucalyptus grow and flourish for several successive years without frost.

**The Sea.**—The sea is one of the chief features of Sandown. The bay is a brilliant expanse of water, bounded by a picturesque coast-line with great variety of formation and colour of cliff. The sands are broad, shallow, and everywhere firm and safe.

**Meteorology.**—For the following valuable records and means of meteorological observations at Sandown, extending over long series of years, the Committee has to thank Mr. W. E. Green, M.R.C.S. Drs. Barker, Meeres, and Smith have also furnished important information.

TABLE I.  
MEANS OF TEMPERATURES FOR TWELVE YEARS.

MONTH.	Maximum by Day.	Minimum by Night.	Mean Daily Range.	Average Mean Temperature at 9 A.M.
January .	45·8	35·6	10·2	40·7
February .	47·4	37·8	9·6	42·6
March . .	50·6	38·4	12·2	44·5
April . .	55·4	41·1	14·3	48·3
May . .	62·2	46·7	15·5	54·4
June . .	67·7	51·6	16·1	59·7
July . .	70·2	54·3	15·9	62·2
August .	71·2	54·9	16·3	63·0
September	66·1	51·0	15·1	58·6
October .	58·8	44·7	14·1	51·7
November	52·7	41·1	11·6	48·7
December	47·8	37·1	10·7	42·5
Means .	58·0	44·5	13·4	51·4

TABLE II.  
MEANS OF OTHER METEOROLOGICAL RECORDS FOR TEN YEARS.

YEAR.	Rainfall.	No. of Rainy Days.	Barometer.	Bright Days.	Days of Fog.
	Inches.		Inches.		
1877	38·66	178	—	—	—
1878	30·59	107	30·034	—	—
1879	37·26	159	30·087	—	—
1880	37·66	132	29·985	230	5·00
1881	36·09	145	29·960	236	4·00
1882	36·67	151	29·920	262	—
1883	32·56	145	30·037	251	2·00
1884	26·61	119	29·901	287	·75
1885	29·24	144	30·117	268	1·25
1886	38·01	160	30·032	266	2·50
1887	23·32	91	30·128	290	5·50
1888	28·69	149	30·677	257	6·00
Average	32·96	142	30·025	261	3·00

TABLE III.  
NUMBER OF BRIGHT DAYS ON WHICH THE SUN SHONE FOR ONE HOUR OR  
MORE, FOR NINE YEARS.

YEAR.	Jan.	Feb.	Mar.	April	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	TOTAL
1880	9	19	26	22	28	13	24	22	17	14	16	20	230
1881	16	12	20	22	23	19	22	22	20	23	17	20	236
1882	16	18	26	25	28	23	24	22	27	18	20	15	262
1883	16	17	26	22	18	21	25	27	20	19	21	19	251
1884	17	19	22	27	27	27	30	29	24	28	21	16	287
1885	18	16	26	29	26	26	27	29	25	19	9	18	268
1886	22	16	21	27	25	22	21	29	22	22	21	18	266
1887	17	23	28	27	20	25	30	30	27	26	17	26	290
1888	19	22	20	25	26	20	17	22	25	27	15	21	259
Means	16·7	18	23·9	25·1	24·6	21·8	24·4	25·8	23	21·8	17·4	19·2	261

TABLE IV.  
DIRECTION OF THE WIND: AVERAGE OF OBSERVATIONS DURING THE LAST  
TWELVE YEARS.

DIRECTION OF WIND AND NUMBER OF DAYS IN YEAR.							
N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.
22	38	52	26	25	74	72	52
138				223			



When these figures are analysed and compared with those from other places, it is found that the winter months are decidedly warmer at Sandown than in London. The rainfall is high for this part of the south coast, being nearly equal to that of Sidmouth and Babbacombe, far to the west. On the other hand, the number of rainy days is represented as exceedingly low.

**Drainage.**—Sandown is drained partly on the duplex system. The surface water from the streets near the sea is conveyed thither by one set of drains. The sewage and the rest of the surface water are taken to be chemically treated in deposit-pits, some distance beyond the town; thence the liquid portion is discharged into the sea with the ebb of the tide, about a mile from the town.

**The Water** is derived from the River Yare, near Alverstone, filtered, and pumped into a reservoir in the upper part of the town. The supply is abundant and constant. The water is palatable and soft, and has repeatedly been pronounced to be wholesome by experienced analysts when doubts have been raised respecting the purity of the source.

**Prevailing Diseases. Mortality. Common Causes of Death.**—Anæmia is not uncommon among the poorer classes. In visitors it is greatly benefited by change to Sandown, especially combined with a course of iron or arsenic. Debility consequent on residence in the tropics, or on nervous prostration, also improves here. Scrofula appears to be uncommon, and to be declining in frequency, amongst the inhabitants. Pulmonary tuberculosis would appear to be of ordinary frequency in the resident population; hæmoptysis uncommon. Phthisical patients sent here in an early stage derive most benefit in the first part of the winter season—October to January. After that date they run considerable risk of aggravation of their disease by the cold easterly winds, pleurisy and pneumonia supervening as complications. Bronchitis and catarrh are said to be prevalent during the colder winter months. Asthma is common, particularly in houses by the sea, and when the south-east wind blows. Bright's disease, acute and chronic, is regarded by all the local authorities as being comparatively uncommon; and cases in visitors are believed to do well. Calculus is positively rare. Rheumatism is probably of average frequency, at all events in the chronic forms. Rheumatoid arthritis is occasionally met with; but more in men, and with

neurosal associations. Neuralgia is common, particularly sequential to influenza. Eczema is not infrequently met with. Malaria, chiefly tertian ague, was extremely prevalent here fifty years ago. Now, consequent on the better draining of the marshes, the compulsory cleaning of trenches, and the opening of the railway, indigenous cases are practically unknown; although cases probably still occur at the northern extremity of the bay, in connection with the low marsh land there.

Typhoid fever has virtually disappeared from Sandown since the new water supply was established in 1863. Diarrhœa is not prevalent, even in summer. Scarlet fever has occasionally made its appearance and spread through the town. There are also occasional outbreaks of diphtheria, particularly in outlying parts. Endemic sore throat is not uncommon.

The mortality was 11·9 per thousand for 1893; or, excluding visitors, about 10·2 per thousand. The zymotic death-rate was 0·8 per thousand. During the same year thirty-three cases of infectious diseases were notified under the Act, as follows:—Small-pox, two (imported); scarlet fever, twenty-one; enteric fever, four (two imported); membranous croup, two; diphtheria, two; erysipelas, two.

The common causes of death are bronchitis, phthisis, heart disease, cancer, and nervous diseases. Many persons live to an advanced age. The following table of Mortality is extracted from the annual Report of the Medical Officer of Health, 1892:—

Under 12 Months.	1 to 5 Years.	5 to 15 Years.	15 to 25 Years.	25 to 65 Years.	65 Years and Upwards.	TOTAL.
10	8	3	2	17	17	57

Of the seventeen persons over sixty-five years, sixteen were above seventy; and one was aged ninety-five.

**Therapeutic Effects and Uses.**—When we examine the physical and climatic features of Sandown, we find in it an open, bright, bracing but relatively warm health-resort, with a great expanse of open sea to the east, an exceptional extent of sandy shore, a fairly dry situation, and full exposure to the downs on the west. These properties would indicate the use of this place



for scrofulous children, for the more robust cases either of incipient or of chronic quiescent phthisis, and for people generally who have been debilitated in body or in mind by acute illness or by the unwholesome influences of town life, and are in need of a "tonic" or mildly bracing atmosphere. Experience confirms the correctness of these conclusions; but it also teaches us that special precautions must be adopted in recommending Sandown to patients. The chief facts to be borne in mind in this connection are: the open, exposed conformation of the place; the comparative want of local shelter; the prevalence of winds from both westerly and easterly directions; the presence of clay and of flat marshy land near the town; and lastly—and probably a result of these local conditions—the prevalence of acute pulmonary diseases during the later winter months and the early spring. In the summer, autumn, and early winter months, the valuable features of Sandown are easily appreciated—namely, its thoroughly marine situation; its fresh breezy aspect landwards, also; the comparative coolness of its atmosphere in what is called the hot weather of June, July, and August, with its comparative mildness in October, November, and December; and the absence of fogs. For certain classes of patients that may be sent here it is also an important feature of the place that exercise can be freely taken on moderately sloping ground between the beach and any part of the town. For the same reason, certain cases of valvular disease of the heart recover compensation very satisfactorily here. Sandown has also frequently proved useful in hay-fever, although it by no means suits all asthmatics. Lastly, it is likely to become more and more popular as one of the best places in the country for sea bathing.

The proximity to Sandown of the remarkably extensive remains of the Roman Villa at Brading ought not to be left unmentioned.

#### FRESHWATER.

Freshwater is a village and district of 3,406 inhabitants, at the western end of the Isle of Wight, lying at the foot of High Down and East Afton Down. Through it flows the sluggish Yare, and the houses of the original village are but little above sea-level.

It is well protected from the south and west by the conformation of the land; and there is also abundant local shelter afforded by trees and other vegetation. The air is pure, and in summer very bracing; in winter it is very cold.

The soil consists of beds of sand and clay belonging to the eoene. The cliffs on the south coast are chalk, which loses itself in the sea at the Needles.

The water-supply is derived from a spring at the foot of Afton Down, pumped up to a reservoir on the top.

The system of drainage consists of common cess-pits to the larger houses. Amongst the more crowded cottages the pail system has been for some time enforced by the Rural Sanitary Authority.

**Prevalent Diseases and Effect of Climate.**—Anæmia is commonly met with amongst young girls of the working classes, who soon recover under treatment, but are liable to recurrence. Professional men and hard-worked business men from our large cities begin to improve after breathing for a week or two the invigorating air of the downs on either side of Freshwater Bay.

Scrofula and tuberculosis occur amongst the permanent labouring population, and appear to originate from early marriages, inter-marriages in too closely related families, and improper feeding in infant life.

Dr. Hollis, who has taken great pains in connection with the preparation of this report, is aware of only three cases of pulmonary phthisis at the present time (February, 1894) amongst a permanent population of over 3,000. All had hæmoptysis in their early history. Visitors suffering from pulmonary tuberculosis in the early stage, and able to keep up on the downs, have improved rapidly here.

Bronchitis and catarrh are as frequent in Freshwater as elsewhere. Cases of pneumonia and pleurisy occur during exceptionally severe weather amongst persons much exposed. Asthma is very rare amongst the permanent population. Visitors with asthma have come to Freshwater year after year because the place suited them, whilst others have seemed to be worse and have had to go away.

Acute renal dropsy and chronic albuminuria have only been met with in visitors.



Rheumatism is not more frequent here than elsewhere. Rheumatoid arthritis has only been met with twice during a period of nearly twenty years. Neuralgia is of about the usual frequency. By far the most common disease of the skin is eczema infantile.

Malarial affections never originate here. Among coastguardsmen and artillerymen who have served abroad ague is not uncommon.

Typhoid fever is very rarely met with as originating here, and has been confined to the one house. Imported cases have occurred, but have never led to an outbreak of the disease.

During a very hot, dry summer several cases of diarrhoea will occur, especially amongst the visitors; although the residents also suffer. The disease is seldom met with at any other time.

In 1883-4 there was a severe epidemic of scarlet fever all over the island; and isolated cases occur now and then.

In 1887, when diphtheria was so prevalent all over England, Freshwater suffered rather severely; but before and since that time cases have been only occasionally met with.

Endemic sore throat is unknown here.

The common causes of death are bronchitis, phthisis, pneumonia, diphtheria, cancer, acute rheumatism, membranous croup, scarlet fever, influenza, apoplexy, and valvular disease of the heart.

There are fifty-three persons now living in Freshwater between the ages of seventy and ninety-two.

Freshwater has stretched out two arms to the sea. The one, towards the south, reaches Freshwater Gate, where it takes the shape of two hotels, a few villas, and a number of cottages—which accommodate visitors in the busy season. The other arm extends to the north-west coast at Totland Bay. This place occupies a beautiful situation, overlooking Hurst Castle and the east extremity of Christchurch Bay. It appears to be becoming more frequented, as the ground is being rapidly covered with red brick houses—some of a superior kind, others of the villa lodging-house type. In both these seaward extensions of Freshwater the air is fresh and sweet, the prospects of the sea are very beautiful, and the vegetation is vigorous and abundant without being close or stifling. At Freshwater Gate there is a small tract of sands; at Totland Bay a pier.

**Therapeutic Uses.**—The impression conveyed by this part

of the Isle of Wight is one of freshness with softness. The district would appear to be well suited for short periods of residence at the coast, rather than for short visits to it. It offers a valuable summer change in some cases of chest disease. The journey, however, includes a long drive by coach or carriage. As a place for convalescence after acute disease or operation it presents great attractions. Golf is played on the downs. The district is also one of much geological interest, Alum Bay being a natural wonder and an open book.

#### YARMOUTH.

Yarmouth, at the mouth of the Yare, on the north-western shore of the Isle of Wight, cannot be regarded as a health-resort. It is a picturesque little town, with an ancient look, but with little suggestion of modern sanitation. In front it is bounded by a muddy shore; behind, by marshes drained by the Yare, itself in great part an arm of the sea.

#### COWES.

Cowes stands on an angular projection of the north-west coast of the Isle of Wight towards the mainland, part of the district, including Egypt and Gurnard, having a westerly aspect, whilst another portion, including Osborne, looks even more directly to the east. This variety of exposure of itself suggests a considerable variety of climate within a small boundary.

The Medina, with deep and broad channel and sloping banks rich in pastoral beauty, runs through Cowes in its course northwards, and divides the town into two distinct and different portions—East and West Cowes. The whole shore of the inlet of the Solent, on which the town is built, is distinctly hilly, with a somewhat steep ascent abundantly covered with trees.

The aspect of East Cowes is westerly, and the abundant vegetation is evidence of complete protection from easterly winds by the ridges of Norris and Osborne in the rear.

West Cowes, the busy part of the town, lies deeply under the opposite ridge, along the brink of the estuary. It is thus completely sheltered from the prevailing westerly and south-westerly winds. Sometimes, indeed, the air here is almost stagnant. Further, this part of the town is robbed by the hill of the setting



sun, whilst it is exposed to northerly gales. It is thus either too relaxing or else chilly.

The more attractive and salubrious part of West Cowes extends along the seashore westwards, by the Parade and the Green, where the trend of the land behind breaks the force of the east wind. Still further west is Gurnard, a rising suburb, built behind a cliff, and dipping almost to the sea-level on all sides. This part of Cowes is exposed and bracing, and at the same time enjoys more sun.

Lastly, the tableland of Northwood, on which new houses of some importance are steadily rising, combines a more free exposure to wind and sun, and more beautiful prospects than can be claimed by Cowes proper.

The elevation is nowhere great, the highest point being at the Horse-Shoe, two miles from the shore. Mill Hill, quite close to the town proper, and Gurnard, overhanging the beach, rise to over 150 feet.

**Geology and Soil.**—The geology of Cowes is that of the northern half of the island, already sufficiently described at page 205. At East Cowes we meet with various series of the eocene beds, and the formation mostly found is clay and gravel, with occasional bands of limestone. On the west side of the river the later miocene deposits of a similar kind form the upper crust. The various sands lying at some depth from the surface here, as well as clay and gravel, with occasional limestone, constitute most of the subsoil.

**Climate and Meteorology.**—The table on the following page presents the means of certain important meteorological observations, extending over a period of thirty years (from 1858 to 1887 inclusive), and furnished by the late Dr. Bernard Hoffmeister.

There are no observations of the temperature of the sea.

The prevailing winds are south-west to west; the former moist, the latter dry. The situation of Cowes on the north side of the Isle of Wight enables it to escape the effects of heavy gales from the Atlantic which reach some other places. Next in frequency are the north-east winds. These are dry and unpleasant, but complete shelter from them is found at East Cowes.

**Drainage and Water Supply.**—The system of drainage in use is water-carriage through sewers; and the proximity of the sea renders the final disposal of the sewage very easy. At West

MONTH.	TEMPERATURE.			RAINFALL.	BAROMETER.
	Dry Bulb, 3 P.M.	Wet Bulb, 3 P.M.	True Mean Temperature.		
January .....	39°3	38°6	39°8	ins. 2·99	ins. 29·978
February .....	40·4	39·5	41·1	2·22	29·994
March .....	41·2	39·8	42·3	1·75	29·928
April .....	45·8	44·7	47·2	1·61	29·936
May .....	51·3	50·0	52·3	1·85	29·985
June .....	56·8	55·5	58·0	1·88	30·006
July .....	61·8	59·4	62·1	2·43	29·999
August .....	60·7	58·6	61·4	2·21	29·977
September ...	56·1	55·4	57·6	3·35	29·966
October .....	50·7	49·7	51·4	3·38	29·915
November ...	43·4	42·2	44·1	3·01	29·936
December .....	40·2	39·4	40·8	2·90	29·947
Means .....	49·0	47·7	49·8	29·58	29·964

Cowes there are two sources of water. The older is a collection of superficial springs fed by water which has filtered naturally through many feet of fine gravel on the back of the Northwood tableland. It is of very good quality. The newer, and at present purely supplementary, supply is obtained in abundance from a well sunk 320 feet below the surface at the top of Mill Hill, into the Headen beds. This is also excellent water.

At East Cowes an abundant flow of pure water is obtained from pipes deep in the gravel.

The accommodation provided for visitors is very good.

**Mortality.**—The death-rates of Cowes per thousand may be thus represented:—

Year.	West Cowes.	East Cowes.
1884... ..	14·43	9·0
1885... ..	14·43	14·66
1886... ..	13·0	11·33
1887... ..	13·14	11·33
1888... ..	13·71	12·0
Mean of 5 years	13·74	11·66



The following figures relate to the birth-rates:—West Cowes, 30·06 mean annual rate per thousand; East Cowes, 29·5.

**Therapeutic Effects and Uses.**—The name of Cowes is inseparably associated with yachting and the yachting season, and the chief claim of the town to notice as a health resort is that it affords the most perfect opportunity of enjoying this kind of relaxation. Smooth water can be found here in every sort of weather. Persons in search of health in the summer season, and even those in pursuit of pleasure, would select the shore by the Parade and Green in West Cowes as their place of residence.

As a climatic resort in winter for sufferers from diseases of the chest, the high character given it by some local authorities can hardly be substantiated. Of the two parts of the town, East Cowes would be the better situated for this class of persons, completely protected as it is from the east winds.

In loss of flesh and exhaustion consequent on acute febrile disease, the recuperative influence of the climate of Cowes is unquestionably useful. Nervous affections characterised by excitement are said to be subdued by residence in this locality, possibly because of the lessened inclination to worry and anxiety induced by the quiet and general mildness of the situation. Excellent bathing is to be had along the shores and in a well-appointed bath-house. Steamers run daily in many directions on short trips.

The Committee desires to acknowledge the great assistance it has received in the preparation of this part of the report from Dr. John B. Hoffmeister, who has permitted it to make free use of a manuscript article on Cowes by the late Dr. Bernard Hoffmeister.

#### RYDE.

The town of Ryde, with a population of 10,952 inhabitants, is built on the eastern and northern slopes of a considerable eminence on the north-east coast of the Isle of Wight, over against Gosport. The relative lowness of the northern shore of the island, as has been already described on page 205, is at this part agreeably interrupted by irregular elevations and intermediate valleys; and Ryde thus occupies a picturesque situation with pleasing variety of level and aspect. The principal exposure is to

the north and north-east, overlooking Spithead, with Portsmouth and Southsea in the distance. Considerable protection from the prevailing south-west winds is afforded both by the configuration of the land and by an abundant growth of trees and other vegetation.

**Geology and Soil.**—Ryde is situated on alternate beds of clay, stone, and gravel of the tertiary series. The greater part of the town having been built before the construction of the water-works, wells were sunk to supply many of the houses. These wells, although they are not now used, serve the excellent purpose of draining the water from the upper permeable strata to lower levels; so that, although the town stands partly on clay and faces north, it is dry.

**Climatology and Meteorology.**—For the accompanying tables of the meteorological records extending over a number of years, the Committee is indebted to the kindness of Dr. A. Banks, who has also furnished all the returns respecting the prevalence of disease and the death-rates, and other information of great value respecting Ryde.

## TEMPERATURE.

## MONTHLY MEANS FOR TEN YEARS.

January .....	38°·6	July .....	62°·8
February .....	42°·1	August .....	63°·2
March .....	43°·9	September .....	60°·1
April .....	49°·2	October .....	52°·2
May .....	54°·2	November .....	45°·5
June .....	60°·0	December .....	41°·2

## YEARLY MEANS FOR TEN YEARS.

Mean of the Highest .....	56°·0
"    "    Lowest .....	46°·6
Mean Temperature of the Air .....	51°·3
Mean Daily Range .....	10°·0
Mean Relative Humidity .....	78°·6

## RAINFALL.

	Inches.		Inches.
1878 .....	29·48	1887 .....	21·54
1879 .....	34·81	1888 .....	28·49
1880 .....	33·52	1889 .....	25·41
1881 .....	32·30	1890 .....	25·75
1882 .....	33·50	1891 .....	37·13
1883 .....	29·19	1892 .....	25·24
1884 .....	25·16	1893 .....	27·42
1885 .....	28·09	1894 .....	38·64
1886 .....	33·65		

Yearly mean for seventeen years (1878-94), 29·96 inches. The freedom from mist and the brightness of the sky in November are noticeable.



## DIRECTION OF WIND DURING 1894.

DUE.					BETWEEN.				
N.	S.	E.	W.		N. & E.	E. & S.	S. & W.	W. & N.	
Days..... 18	... 11	... 7	... 16		Days..... 81	... 48	... 109	... 75	

**Drainage and Water Supply.**—The drainage of the town has received much attention. The sewers consist of glazed earthenware pipes, with street ventilators, open gratings, and shafts. The main sewer is carried out to sea beyond low-water level, and the sewage is believed to be washed into the Solent by the tides and never deposited again on the foreshore.

The water is brought from springs on the chalk and greensand four miles to the southward of the town. Specimens submitted to Dr. Percy Frankland have been very favourably reported on by him.

**Prevalence of Disease: Death-Rates.**—During the five years 1889–1893 inclusive, 30 cases of typhoid fever were notified, and 5 died; diarrhoea proved fatal in 10 cases; of 83 cases of scarlet fever, 1 case proved fatal; and diphtheria occurred in 16 instances with 7 deaths. The zymotic death-rate for the same period was .64 per 1,000, the general death-rate 14.86 per 1,000. The death-rate from phthisis was 1.224 per 1,000; that from bronchitis, pneumonia, and pleurisy, 2.097. Renal diseases are uncommon; calculus is very rare indeed. Rheumatic affections are more prevalent. Eczema is rare. Malarial affections and endemic sore throat are unknown.

Aged people form a large proportion of the permanent residents; and the great age reached by many of them proves that the climate of Ryde is particularly suitable to them.

**Therapeutic Effects.**—Ryde owes its popularity as a seaside resort more to its situation than to any special virtues referable to its climate. It is the chief port for passengers between the mainland and the Isle of Wight; and the continual movement of visitors, during the summer season in particular, serves to make it lively and attractive. The town is pleasantly placed, bright and sunny, and its streets are clean and cheerful, with an air of general prosperity. The accommodation provided for visitors is of a superior order. These, with the attractions of the sea proper, as distinguished from those of beach and parade, are fully developed. It is true that there are ornamental gardens separated from the

shore only by a sea wall and promenade, which are well adapted for children, and take the place of the sands of other coast towns. But it is for the number and variety of the sea excursions at Spithead, along the Solent and around the island, which Ryde offers, and for the excellence of its boating and yachting, that it is chiefly popular as a resort in the holiday season. The promenade pier, carried an exceptional length into the sea, affords the full benefit of marine influence. Bathing is arranged on the second pier.

In the neighbourhood of Ryde there are many beautiful drives; and it also serves as a convenient starting-point for a number of other places of interest in the island.

Ryde has now become a residential town of considerable importance for delicate persons; and some subjects of chronic pulmonary disease have settled here with benefit.

#### SEA VIEW.

Three miles to the east of Ryde, in a pretty situation on the coast, is the village of Sea View, which deserves to be mentioned—if it do not require to be described—along with the more important health-resorts of the Isle of Wight. Sea View is very small but attractive. It boasts of a pier, good bathing, and a special service of steamers from Southsea in the season. It will be found a convenient place for a pleasant summer or autumn holiday by those who from taste or circumstances prefer a resort which is not overrun by visitors and tourists, and where comfortable accommodation can be found at moderate prices.



## THE CLIMATE OF THE SOUTH-EASTERN COUNTIES.

By WILLIAM EWART, M.D., F.R.C.P.

IN acknowledging the courtesy of those gentlemen who have sent replies to the Society's circulars, the Reporter records his special thanks for valuable suggestions and for contributions to his friends Dr. R. H. Clarke, of Westwood, Thanet, Dr. R. L. Bowles, F.R.C.P., Mr. Pugin Thornton, of Canterbury, Dr. F. Bagshawe, F.R.C.P., of St. Leonards, Dr. J. Pollock, F.R.C.P., Dr. Symes Thompson, F.R.C.P., Dr. S. Rideal, D.Sc., F.C.S., Mr. W. H. Coke, L.R.C.P., M.R.C.S., of Ashford, Mr. Lovell, L.R.C.P., M.R.C.S., of Hastings, Mr. H. L. Albert, F.R.C.S., and Mr. J. Dewrance, of Chislehurst; and to Mr. Julius Caesar, M.R.C.S., of Minster, Sheppey, Dr. A. Newsholme, of Brighton, Dr. J. Underwood, of Hastings, Dr. J. G. Marshall, of St. Margaret's Bay, Mr. W. L. Chubb, M.R.C.S., of Sandgate, Dr. Gabbett, of Eastbourne, Dr. Scott and Dr. Harrison, of Sandwich, Mr. F. Campbell Bayard and Mr. E. Lovett, of Croydon, Dr. A. Flint and Dr. A. F. Street, of Westgate, Mr. J. S. Harris, L.R.C.P.I., M.R.C.S. of Birchington, Dr. Ryan Tenison and Dr. Wills, of Bexhill, Dr. C. E. Fitzgerald, of Folkestone, Dr. C. Parsons, of Dover, Dr. J. H. Gramshaw, of Gravesend, Dr. Pringle Morgan, of Seaford, Mr. J. Watkinson, of Herne Bay, and to the late Mr. F. Legros Clark, F.R.C.S.

### INTRODUCTORY REMARKS ON THE SCOPE OF THE REPORT.

Mildness of temperature and fair equability are shared by both halves of the southern district of England. They are both suitable for a large number of invalids; but a practical advan-

tage is secured to the south-east, owing to its vicinity to London: its geographical position points it out as a health-district for the Metropolis. This report cannot pretend to have done full justice to the claim for detailed information thus implied, though it may suggest some of the directions in which further climatological study is needed, and calls attention to the capabilities of localities hitherto imperfectly known in relation to health. The chief aim of therapeutical climatology should be to provide the elements for a selection of suitable health stations; and an attempt has been made to trace the ground-plan of a report in which this indication might at some future time be more fully carried out.

Few invalids are in a position to build upon fresh sites. For the majority the choice of a residence is limited to the recognised health-resorts. This is not, however, the only reason for directing special attention to the towns in preference to rural districts. Precise data, whether in meteorology or in medical climatology, are, with rare exceptions, confined to towns and to their immediate neighbourhood. The meteorology of intervening regions can at best be inferred from observations taken at more or less distant stations, and does not possess any claim to accuracy, except in its relation to geological facts, which have been worked out with greater completeness. The medical climatology of the country districts is a still more difficult, and, under the present conditions of this inquiry, an almost hopeless study.

Again, concerning the climate of any one town or locality, statements can hardly possess more than a general scope, since the test of more strictly local sites, like that of each separate house, is after all an individual one; their ultimate value, depending largely upon the individual capabilities of the residents for improving or correcting local conditions, cannot be determined in a report of this kind. On the other hand, as regards the public health, and to a certain extent the general climate of towns, we have the advantage of accumulated experience and of statistics. For these reasons special stress has been thrown upon the medical climatology of urban districts; and so far as this has been made possible by the receipt of answers to the circulars sent out on behalf of the Committee, every important town laying claim, in virtue of its position or repute, to the qualification of a health-resort has been



noticed in the report. In particular the seaside places, which form the majority of the health stations, have been described one by one.

It would be impossible to do even justice to all uninhabited sites for which health-giving properties might be claimed. The south-eastern counties are rich in sites of this kind as yet unnoticed or undescribed. In dealing with them the most suitable method is probably to study the elements of climate in the larger sections, and to show how in more limited areas the local modifications or the varying combinations of these elements might determine some one or other definite product.

Since detail and precision are the measure of the usefulness of any investigation of this kind, special stress has, in a tentative manner, been laid upon a few limited portions of the region under review, as an illustration of the manner in which other parts might have been treated under more favourable circumstances. Thus: the Island of Thanet is not only geographically, but also in respect of the climatological influences bearing upon it, a separate district. The same is also true of the East coast of Kent. Forming together the south-eastern extremity of Great Britain, they constitute the most eligible starting-point for any attempt at a comprehensive description.

Again, the Island of Sheppey has been treated with some detail as an interesting sample of the climate of the estuary of the Thames.

In Surrey the regions known as the Pine country, and the Bagshot sands district, present important climatic features and have received special attention.

Lastly, the seacoast in general has been the object of more detailed description than inland regions.

#### DEFINITION AND BOUNDARIES.

The district is a roughly triangular area included between the Thames and the English Channel. At the base of the triangle, a line passing through Windsor and Chichester Harbour, would roughly divide Surrey and Sussex on the east from Berkshire and Hampshire on the west.

The three south-eastern counties, Kent, Surrey, and Sussex, taken together, present well-defined boundaries: to the north the River Thames, the estuary of the Thames, and the open sea; to the east the North Sea, and to the south the English Channel. Although towards the west—for Surrey between Windsor and Haslemere, and for Sussex from Haslemere to Chichester Harbour—there is no strictly continuous natural demarcation by river or hill, still the group may be regarded, both geographically and in size, as a convenient unit.

In spite of endless variety in detail, the group possesses a feature of unity in the central valley known as the Weald, which spreads over a limited portion of Surrey and over a great part of Sussex and of Kent, sloping into the sea at a huge gap between the cliffs of Beachy Head and of Folkestone.

Another link is the elongated lozenge-shaped system of hills which surrounds the Weald, except along the line of coast just mentioned, and which presents in the north the Surrey Hills or North Downs ranging far to the east; in the west, a shorter range extending from Bagshot Heath to Haslemere, marking out almost the entire western boundary of Surrey (Sussex lacks any analogous demarcation to the west); and in the south the South Downs, which stretch across Sussex, almost to the borders of Kent.

From Rochester to Charing the central Kentish range extends in a south-easterly direction as far as the broad valley of the Stour, which connects the Weald with the Canterbury plains.

South of the Stour the same oblique direction is taken up by the range which passes behind Folkestone and is continued into the cliffs between Folkestone and Dover.

Less important hill ranges will be described north of the South Downs, and in the centre of the district as well as in the south. Suffice it for our present purpose to note the three natural regions into which the territory in question is divided:

(1) The region between the North Downs and the Thames, a broad strip which may be considered to include the north-easterly portion of Kent.

(2) The Weald with its inland hills and woodlands, its undefended shore, and its submarine forests.

(3) The Sussex coast south of the Downs.

Many rivulets take their origin from the main slopes which we



have described, and run their entire course towards the Thames, or southwards towards the sea. But it is a remarkable circumstance that the North Downs and the South Downs are not watersheds in the ordinary sense. Big rivers do not arise from them but cut their way through them. No less remarkable is the fact that the relatively low-lying Weald does not drain the mass of its waters into the sea along the low-lying coast (the Rother, not a large river, being the most important among those ending there), but through the Chalk Hills, either due south, due north, or due east. This is the outcome of the hilly formation of the centre of the Weald. Around this nucleus of higher elevation the River Wey and the Arun, the Mole and the Adur, the Tun and the Ouse, the Medway and the Rother all come into a close relationship, which permits them to be connected by canals; and most of them adopt a paradox course away from the nearest sea and in the direction of higher lying ridges which they deeply intersect. To this circumstance many of the picturesque features of the district are due.

#### PHYSICAL AND CLIMATIC CHARACTERS.

**Protection from Wind—Exposure.**—The south-eastern district presents advantages from the point of view of health and of natural beauty which it would be difficult to overstate, and a certain moderation in all its features, which is the secret of its particular charm. The virtues of the district might be expressed in two words: temperateness with variety. These are found alike along the coastline and inland. The same wide range of variety is seen in the geology, in the altitude, in the bracing or soothing qualities of the atmosphere and in the climate in general, but without any extremes, so that almost every part of this region could be inhabited with pleasure by the healthy, although not always with safety by invalids.

Its conformation, its scenery, its climatic phases, its vegetation, possess a general evenness of type, with every variety of detail. Its hills are not sufficiently high to claim the name of mountains, its valleys neither deep nor precipitous, its plateaux and its plains, though they give us distance, do not oppress us with boundless space. Its rivers and its streams are easily traced to their sources

by the pedestrian; yet in their short journey to the sea many of them lend dignity as well as grace to the scenery. In its vegetation there is nothing exotic, though the climatic capabilities of the south coast are an exception to this rule; but its fruits, its flowers, and its crops tell a uniform tale of excellence in indigenous growths.

The combination of special climatic virtues with almost unsurpassed loveliness single out to the sanitarian the fair counties of Surrey, Sussex, and Kent as something more than a mere recreation ground. Whilst it is no part of this report to dwell upon their beauty, an adequate description of which is not within the power of ordinary language, their climatic advantages are so varied and important as to deserve careful climatological study. They share with the south-west of England the temperature of a southern latitude, but they contrast with it in the possession of bracing influence.

The district is spared the tempestuous violence of the Atlantic gales, but it is well blown across and from various quarters. To most winds its boundaries afford no barrier. Still within it graduated protection from the colder winds is afforded by a succession of hill ranges disposed in a direction parallel to each other and to the south coast, and offering, according to altitude or to exposure, every shade of climate between the bracing and the relaxing; whilst within these areas the rolling character of the country leads to endless variety of local protection. The prevailing wind is S.W.

Many of the wooded parts are planted with fir, and neither generate nor harbour moisture. Local mists are not absent from the valleys and plains, which are as a whole freely watered.

Thus the district affords very marked varieties of climate depending upon elevation, exposure, nature of soil, vegetation, proximity to the sea or river basins; but the chief points to be considered in this general description are the soil and the elevation, other details belonging to a more particular account of various places.

The character of the soil corresponds pretty closely with the elevation. The London and Weald Clays occupy the low-lying ground and river valleys; the highest elevations are chalk hills; and sand and gravel are mostly found on the slopes of chalk hills



or in situations of moderate altitude. Each of these formations has a corresponding variety of climate which observes almost the same limitations of extent. Thus the chalk hills are dry, very bracing, but exposed to winds, and are cold in spring and winter. The sand, less dry and stimulating than the chalk, rejoices in some very fine climates. High bracing sites such as Leith Hill, Crockham Hill, &c., which have beautiful scenery as well as fine air, are partly wooded with fir-trees, and have none of the barrenness inseparable from chalk; whilst various lower elevations, with abundance of vegetation and sheltered position, present a choice of salubrious sites. The river valleys and low-lying lands, for the most part stiff clay, have a humid and relaxing climate not to be recommended for invalids, though robust people enjoy the best of health in them.

Atmospheric conditions being largely the outcome of geological factors, the report does not depart from the main object of climatology in laying special stress upon geology. In this we are, after all, but following the line of inquiry which patients and their advisers spontaneously adopt in the practical selection of a residence.

Although every site cannot be described with accuracy, a knowledge of the geology and hydrography of the district, coupled with the use of a thermometer and of a hygrometer, will enable the reader eventually to judge for himself of the climatic capabilities of any spot.

#### GENERAL SKETCH OF THE SURFACE GEOLOGY OF THE SOUTH-EASTERN DISTRICT.

The northern part of this district, including Middlesex, the northern part of Surrey, and the river and seacoast of Kent, except Thanet, is chiefly formed by London Clay.

In West Surrey the boundaries of the deposit broaden considerably from north to south, but the greater part of the surface is occupied by the extensive area of Bagshot Sands which wedges itself into the clay district as far as Cobham, and includes part of Windsor Great Park, and such places as Weybridge, Woking, Worplesdon, Chobham, Bagshot, &c.

London Clay reappears only at the extreme south-west of Sussex

in the districts of Arundel and Chichester. This is the eastern extremity of the extensive belt of clay which ranges from Durrington to near Dorchester, a few miles away from the south coast.

The remainder of the district can be summed up in two words: the "Weald" and the "Chalk."

The "Chalk" area, a continuation of the vast surface deposit which from Dorset extends as far as Dover in the east, and in a north-easterly direction as far as King's Lynn and Wells, forms a southern tract connected with the South Downs, which constitutes the greater part of the south coast of Sussex as far east as Eastbourne; and a northern tract beginning as a thin point at Farnham and broadening out towards the east through Surrey and Kent, where its greatest thickness is acquired along the coast between Deal and Folkestone, Thanet being an isolated dependency of the same tract.

Chalk underlies the London Clay in the north, and, owing to its gradual rise, becomes superficial in Wiltshire, Dorsetshire, Hampshire, and northern Surrey. It ends abruptly at the borders of the Weald, where it appears to have become worn away, allowing the deeper strata to come to the surface in successive concentric layers.

The "Weald" consists of concentric deposits of Upper Greensand and Gault, of Lower Greensand, and of Weald Clay, surrounding a central oval nucleus of Hastings Sands; the whole being wedged in between the two zones of chalk, and forming an important section of the seacoast between Folkestone and Eastbourne.

The outer boundary of this region denuded of its chalky crust begins in the west, just outside our district, in Hampshire. The chalk ceases east of Alton, and the Upper Greensand begins as a narrow belt which immediately surrounds an equally narrow belt of Gault.

The belt of Lower Greensand begins, also outside the district, at Petersfield in Hampshire; it is in immediate contact with the Gault.

Within the district itself the outer zone of the Weald—viz. the Upper Greensand—remains throughout a very slender belt (five miles in width), and describes an elongated oval, the axis of which would pass from Alton to Rye, *i.e.* from the north-west towards the south-east.



The oval is incomplete and intersected by the coast, which cuts the belt of Upper Greensand at Folkestone in the east and at Polegate behind Eastbourne in the west.

The whole line of coast between these extremes is a section through the denuded area of the Weald, and for the greater part through the central mass of the nucleus, viz. the Hastings Sands. The portion of the outer belt which extends from Maidstone to Folkestone consists, according to the geological ordnance map, almost exclusively of Gault, whereas in the western portions the Gault is rather less abundant than the sand.

The belt of Lower Greensand, which reaches its extreme westerly point near Petersfield, stretches across to Haslemere. Towards the north-west it is also relatively broad (from seven to ten miles). Godalming is included in its area. But beyond Leith Hill it narrows down to about two miles, and contains Dorking, Reigate, Godstone, Betchingley, Westerham, again broadening slightly at Sevenoaks, West and East Malling, and Maidstone. At Ashford it is again barely more than two miles wide, and finally widens again between Aldington and Sandgate. The latter, together with Shorncliffe, Hythe, and Lympne, belongs to this formation.

Within this slender outer framework fits a much broader belt of Wealden Clay, attaining its maximum width between Haslemere in the Greensand and Horsham in the Hastings Sands, but tapering considerably towards Eastbourne (east of which it forms barely more than one mile of seafront), and rather less markedly farther north. It extends past Tunbridge, which it partly underlies, as far as the alluvial plain of Romney, from which it is divided by the Grand Military Canal.

The whole area included between this crescent of Wealden Clay and the sea is occupied (with the exception of Romney Marsh, of the alluvial surroundings of Rye, and of those of Pevensey) by sandbeds of various kinds, which may be grouped under the name of Hastings Sands. These underlie Horsham, East Grinstead, Cuckfield and Uckfield, Tunbridge Wells and part of Tunbridge, Cranbrook, Tenterden, Crowborough, Mayfield, Frant, Wadhurst, Ticehurst, Bexhill, St. Leonards, Hastings, &c. This sandy region may be regarded as the imperfectly oval nucleus of a concentric system of geological deposits, with axis inclined from

N.W. to S.E., stretching as far as the coast, which interrupts the oval near its lower extremity.

"Alluvium" occurs in scattered order along rivers and parts of the coast; but mainly along the Thames, the Stour, the Rother, and the Ashburn, and over the full extent of the Romney Marsh.

The following imaginary lines, traced through the south-eastern district, may facilitate a study of the complex arrangement of its superficial strata:—

I. A line drawn from the Thames at Egham due south to the mouth of the Arun would cross in succession a narrow strip of London Clay, and a broad surface of Bagshot Sands (Woking lying near its southern border) which intervenes between the latter and the southern offshoot of the London Clay deposit. This southern strip having been crossed, the line falls upon the Wealden system, passing over Guildford and its narrow belt of chalk and over a thin streak of Upper Greensand and a belt of Lower Greensand, which has acquired, at this longitude, some width. The Wealden Clay is crossed at an equal distance from its western extremity and from Horsham, which marks the beginning of the Hastings Sands. Beyond the clay the line crosses once more the ring of Lower Greensand, close to Petworth, and that of Upper Greensand, both being of moderate width.

The broad belt of chalk which extends southwards to the sea is interrupted between Arundel and Ford by a narrow tongue of London Clay and Woolwich Beds, which extends eastwards from Hampshire, underlying Chichester, as far as Durrington.

II. A line drawn due south from Greenwich to the Brighton coast, starting from an isolated strip of chalk on the bank of the Thames, traverses the London clay to West Wickham and Farnborough (where it runs across a broad belt of chalk), and in succession the concentric Wealden belts of upper greensand, of lower greensand, and of clay, the two first being of small width, especially the upper greensand; and the western end of the Hastings sands nucleus. It then crosses again in reversed order the clay, the lower greensand, the upper greensand, and the chalk (between Brighton and Lewes), the last named being, in the south, the broadest among these strata.

III.—A line drawn from Sheerness in Sheppey to Rye. This line encounters alternations of alluvium and of London clay both



in Sheppey and in North Kent; then a broad belt of chalk from the neighbourhood of Bapchild to that of Lenham on upper greensand. This latter deposit forms a narrow belt, the lower greensand a broader one; and considerable width is attained by the Wealden clay. At the latitude of Folkestone the eastern extremity of the Hastings sands nucleus is encountered; but it is indented by the alluvial deposit extending westward from the Romney Marsh, and does not in this section reach the shore.

IV.—A line drawn from east to west between Dover and Tunbridge Wells, emerging into Hampshire north of Haslemere, would intersect chalk for miles, and then the Wealden belts of upper greensand, lower greensand, and clay; it would finally travel over Hastings sands past Tunbridge Wells, East Grinstead, &c., emerging at Three Bridges into the full width of Wealden clay, which stretches to an apex near Haslemere; and at this longitude it would encounter again a broad belt of lower greensand.

#### OROLOGY.

**The West Surrey Hills and Chobham Ridges.**—Whereas East Surrey has a soil consisting in the north of clay, and in the south of chalk, Lower Bagshot sand forms the greater part of the soil of Western Surrey, clay extending as a continuous belt both north and south of this triangular area, and the zone of chalk becoming very narrow. In the south where the belt of clay approaches the chalk beds, it presents a margin of Woolwich deposit which extends nearly continuously from Farnham to Croydon.

At the centre of the deposit of Bagshot sands, the outline of which, when completed by the portion in Berkshire, resembles a lozenge, rise the Chobham Ridges which range north and south from Windsor Great Park to Ash near Aldershot.

Part of this system of hills, including the slight rise in Windsor Great Park, at Ascot and at Sunninghill, and Bagshot Heath with Tower Hill, South Hill, Cæsar's Camp, and Broadmoor, are all in Berkshire; but Bagshot itself is within the Surrey borders, and from Crawley Hill and Penny Hill the ridges extend as far as the railway station of Ash.

The Chobham Ridges or northern half of the West Surrey Hills overlook Chobham (nearly five miles distant), its slightly undulating plain, intersected by numerous streams and by the Basingstoke Canal; they overlook also the London clay area between Chobham and Ashted and the rise of the Epsom Downs in the chalk district.

The southern half of the West Surrey Hills is continued from the Chobham Ridges towards the south under different names, past Aldershot to Crooksbury Hill, and the same line of heights rising again beyond the plains of Tilford extends from Kettlebury Hill to Haslemere.

**The Secondary Ranges in West Surrey.**—Still within Surrey, at the extreme south west corner, is the terminal group of the Devil's Punchbowl and Hindhead.

At no great distance, but not in direct continuity, begins a shallow range running east and west, slightly to the south of Witley, Hambledon, and Hascombe.

On the other side of the River Wey, but a little farther north, we encounter another range, which may be regarded as secondary to the North Downs, with which it is parallel. This secondary line of heights, of which Leith Hill (967 feet) is the most prominent representative, extends from Shamley Green to near Holmwood Common.

Leith Hill and the Devil's Punchbowl are both situated on the boundary between the lower greensand and the Wealden clay, one of their two main slopes belonging to the first, the other to the second of these geological formations.

**The North Downs, or Main Surrey Range, and the North Kent Hills.**—The arrangement of the North and South Downs has already been explained. They form as it were the northern and southern ascents to a huge plateau which has disappeared, and laid bare the strata of the Weald. Towards the Weald their fall is abrupt and in parts analogous to the fall of sea cliffs, being, like that of the latter, due to denudation.

These features are strongly marked in the case of the North Downs which we will follow eastward from Farnham. The Hog's Back (504 feet) and St. Catherine's Hill form a ridge stretching all the way to Guildford, where the Wey marks the beginning of the second detachment which is interrupted by the Mole at Dorking. The Merrow Downs (530 feet), the Hackhurst Downs



(744 feet), and Knowl Hill are its prominent heights. South of the same occurs the high range of Leith Hill; and east of Dorking rises Box Hill, the ridge continuing to Gatton where it expands northwards by Chipstead into the Banstead and Epsom Downs.

Eastward (with a slight inclination north-east) the main ridge is continued by the Merstham and Caterham plateau, Winder's Hill (755 feet) not far from Godstone, Woldingham Hill (878 feet), Tatsfield, Chevening, and Knockholt, which the Darent Valley separates from Otford.

On the top of this important range a level plateau extends in parts for miles; elsewhere it is broken up into hills and valleys. It is bounded all along on the north by the valley of the Thames. Altogether this forms an extensive upland abounding in breezy commons, more or less sheltered valleys, dry table lands of good elevation, cold in winter, but healthy and bracing, hills varying from 100 or 200 to nearly 1,000 feet. The formation is principally chalk, but a very considerable proportion is sand. On the south this range descends in steep slopes to the broad plain which extends without important interruption to the South Downs. All along the ridge magnificent views are obtained over all the low country to the hills which overlook the sea along the southern coast.

In continuation of the same line, between the Darent and the Medway, we find another long plateau, of slightly less elevation, slightly curved towards the south, at the foot of which lie Kemsing, Wrotham, Trotterscliffe, and Lower Halling.

On the right bank of the Medway south of Rochester, the ground gradually and then more quickly rises to the heights of Malling Wood, which extend towards Fort Pitt at Chatham, and to New Brompton.

Among the hills of North Kent we should not forget to mention the hill behind Greenhithe, Windmill Hill behind Gravesend, and Gad's Hill north-west of Rochester.

Lastly, the Isle of Sheppey presents Cable Hill near its centre, Ripsley Hill west of Minster, and cliffs at Warden Point.

**The Mid Kent Range.**—South of Rochester, the line of the North Downs, steadily pursued from west to east as far as this point, forms an angle with the south-easterly direction of the range which supplies the eastern boundaries of the Weald. These hills resemble the North Downs in their steep declivity towards the

Weald, but they do not attain the same expanse nor the same elevation. They gradually lose height as they pass Thornham, Hollingbourne (606 feet), and Lenham to Charing. The "Pilgrims' Way" runs along the side of these hills which die away at Eastwell.

Beyond the Stour the same direction is continued by fresh elevations; but these hills have no great height. Etching Hill is 626 feet, and Coldham behind Folkestone 575 feet high. They are continuous with the cliffs which extend from Folkestone to Dover.

In connection with the Folkestone range attention should be drawn to the secondary range—not belonging to the Downs, but to the greensand series, which extends due west from Sandgate, past Hythe, to Lympe, and ends close to Aldington, affording a series of magnificent views and of health-giving sites perhaps not equalled anywhere along the south coast.

**The Dover Range and the Canterbury Hills.**—East of Dover the hills run north-west to Sibbertswold and Womenswold, as far as Higham and the Lesser Stour. The country east of this range to the Sandwich coast presents no elevation, although there is slight undulation.

The hills about Canterbury, on either side of the Greater Stour, do not attain any considerable height.

**The Secondary Hill-Ranges of the Lower Greensand.**—The abrupt fall which occurs towards the south along the high ridge of the North Downs is not so complete as to reach at once the lowest level of the Weald. The belt of upper greensand bounding the chalk line preserves a moderate elevation. This is also the case along the northern slope of the South Downs. In both instances the inner belt of lower greensand is the seat of a secondary rise which in some parts is very considerable.

This secondary ridge internal to the higher ridge of the chalk hills, and likewise presenting a sharp fall towards the Weald, may conveniently be studied from its western extremity, formed by Hind Head and the Devil's Punchbowl. The denuded face of the Punchbowl is exposed to the east, and, unlike the western face, consists of Weald clay. The same mixed formation also belongs to Leith Hill (967 feet above the sea), situated farther east; but the denuded side of Leith Hill faces south. This is the terminal point of the much lower range which extends eastward from the Punchbowl through Witley, Hambledon, and Hascombe, and



gradually rises with Coneyhurst Hill, Holmbury Hill, and Redland Hill to this culminant height of the south eastern counties.

Farther still to the east the secondary rise of the lower greensand may be followed along Tilburstow Hill, Crockham Hill (709 feet), and Ide Hill. And south of Sevenoaks, and of Knole Park, the last detachment of the secondary hill formation in the north extends as far as Plaxtol.

If we now follow the secondary rise as it extends to the south-east from Hind Head, the same arrangement repeats itself; but the hills do not attain any great height; as they become more distant from the Haslemere group they die away, and beyond the Adur the belt of lower greensand presents no secondary ridge—except that which we have already described as occurring on the eastern side of the Weald at Lympe and Aldington behind Hythe.

**The Weald.**—Internal to this double system of encircling hills stretches the relatively vast expanse of the Weald, made up of the central region of the Hastings sands, and of a broad intervening belt of arable.

The belt of Wealden clay where it is intersected by the coast line is almost on a dead level with the sea. The same is not absolutely true of inland parts of the same formation. Slight undulation occurs, but there is a complete absence throughout this area of any mountain or important hill, and from any point along the northern or the southern ridges by which it is surrounded the view stretches as far as the central Sussex hills.

**The Hills of the Hastings Sands Region.**—The nucleus of so-called Hastings sands deposit, which forms the centre of the Wealden system, presents a striking contrast with the Wealden clay in its average altitude, in the irregularity of its surface and the height of some of its hills. It is difficult to trace any system in the complicated variety of its valleys. They do not run a parallel course, although grooved by streams flowing to the north and to the south respectively. Nevertheless, the valleys occupied by the origin and the tributaries of the Rother present a greater agreement in their directions than the smaller system of valleys drained by the tributaries of the Medway, and tend towards the south-east.

It would not be practicable to attempt a description of so

intricate a pattern of hill and dale. Nevertheless, there are a few salient features deserving special consideration, chief among them being the St. Leonard's Forest, the Ashdown Forest, the Rose Hill group, the Goudhurst Hill, and the Fairlight Heights.

The St. Leonard's Forest occupies the rising ground at the western extremity of this geological district, and Tilgate Forest occurs a little farther east. No considerable elevation is encountered however, until we approach the region known as the Ashdown Forest, north of Maresfield and south of Hartfield. An important group of hills, extending from Crowborough to Wytch-cross, is the prominent feature in its landscape.

East of Ashdown Forest, from which it is divided by a tributary of the Medway, a somewhat important range of hills, running eastwards and a little southwards, begins about five miles south of Tunbridge Wells near Rotherfield, and extends through Mark Cross, Wadhurst, Ticehurst to Danehill, on the borders of Sussex and Kent. The isolated ridge of Goudhurst rises in Kent about five miles north of Danehill; it is of very limited extent.

The group of hills among which Rosehill and Greenhill are prominent is situated from five to eight miles south of Ticehurst in Sussex. It forms the northern extremity of the ridge which terminates at Fairlight.

The Fairlight Heights, the only elevated section of the coast between Beachy Head and Folkestone, and only second in altitude to Crowborough Beacon, extend north-westwards inland through Crowhurst and Telham Hill, gradually diminishing as far as Battle. Then rising again the ridge terminates at Rosehill, which is separated from Greenhill by one of the tributaries of the Rother.

The Kentish portion of the Hastings sands district, although possessing the same irregular hilly features, does not present any very important hills, with the single exception of Goudhurst already mentioned.

**The South Downs.**—The course and general configuration of the South Downs is analogous to that of the North Downs. Some of them range rather higher, especially in the west of Sussex. The formation of plateaux is not so frequent, the slope beginning almost from the summit of the ridge. They send towards the sea, from five to ten miles distant, a number of spurs which die away before reaching the coast.



Within Sussex the first important hill is Beacon Hill, east of which occur the Heyshot Downs and Dunstan Beacon and to the south the secondary elevations of Bignor Hill, Bury Hill, Selhurst Park, Goodwood Racecourse, Rook's Hill Beacon, and Bow Hill. North of this secondary range is the valley of West Dean and East Dean.

Between the Arun and the Adur the slope towards the sea is unbroken, except by the slightly projecting heights of Harrow Hill and of Cissbury Hill. Chanctonbury Ring (804 feet) is the culminant point in this range.

From the Adur to the Ouse the ridge itself is even, especially at Wycombe, Saddlescombe, and the Devil's Dyke; and there is a convergence of valleys towards Brighton. The biggest of these runs north-east from Brighton, past Falmer to Southover.

Beyond the Ouse, between it and Glynde, Cliffe Hill stands alone; and south of Glynde rises a rather rugged hill sloping on all sides except the north where it is more abrupt in its fall.

Lastly, Beachy Head forms from north to south a ridge beginning at Willingdon, where, on the west side of a high valley, there is a lesser hill. The slope east and the slope west are both rather strong, whilst the abrupt fall in this instance takes place towards the sea.

#### HYDROGRAPHY.

A very brief sketch will suffice for the object in view. The south-eastern counties may be divided into thirteen hydrographical areas, distributed in two groups, north and south of a boundary line which extends almost due east from Haslemere to the South Foreland. North of the line are three river basins, and a small marine watershed.

(1) The North Kent watershed occupies the interval between Thanet and the Medway, facing the Nore.

(2) The Stour waters the greater part of East Kent.

(3) The tributaries of the Medway branch to the east nearly as far as Ashford, to the south as far as Wadhurst in Sussex, and to the west just beyond the south-eastern boundary of Surrey.

(4) The remaining area belongs to the basin of the Thames, which receives in succession the Darent with the Cray, the Ravens-

bourne, the Wandle, the Mole, the Wey, and the Bourne, all flowing almost due north; the Darent, the Mole, and the Wey cutting for themselves deep channels across the North Downs, and the two latter rivers draining extensive areas south of these hills.

Immediately south of the imaginary line described above, the basins of the Rother (5), of the Ouse (6), and of the Arun (7) form a continuous succession. The smaller basin of the Adur (8) is surrounded north, and partly east and west, by the basins of the Ouse and of the Arun, and is flanked farther south by the small marine watersheds of Brighton (9) from the mouth of the Ouse (at Newhaven) to that of the Adur (at Shoreham), and of Worthing (10) between Shoreham and the mouth of the Arun (at Littlehampton).

The three remaining marine watersheds each occupy a considerable sea front. The South Kent watershed (11) stretches from the South Foreland to the mouth of the Rother near Rye; the Hastings and Eastbourne watershed (12), comprising the rivers Ashburn and Cuckmere, from Winchelsea to the mouth of the Ouse at Newhaven; and lastly the larger watershed (13) which extends from the basin of the Arun to that of the Itchin in Hampshire, includes the territories of Bognor, Chichester, and Portsmouth.

Although, as may be gathered from this rapid survey, the whole district is freely watered, and is correspondingly fertile, still partly owing to the moderate altitudes and to the smallness of most of the rivers, partly to the nature of the soil, and partly also to the active air currents set up by the neighbouring seas, it is alike free from floods, from undue dampness of air, and also from marshiness, with the exception of Romney and Sandwich and of tracts in the immediate vicinity of rivers, particularly of the Thames.

#### GENERAL CLIMATOLOGY.

**The Climate compared with other Climates.**—The climate of the south-eastern district is in a higher degree insular than that of many other districts in Great Britain. It does not lend itself as a whole to more than a distant comparison with continental climates; but in the special case of the south coast the disparity



is remarkably reduced in respect of temperature and sometimes also of dryness. Indeed the towns on the south coast enjoy as a rule a milder climate than many a continental seaside place of lower latitude but facing north.

From other British climates it differs in its greater variety combined with a relative freedom from extremes. Its marine climate and its inland climate are both individualised and marked off against all others: the inland climate by the configuration and geology of the Wealden system, and by the modifying influence of the neighbouring seas; the marine climate by the combined influence of the Gulf Stream and of an easterly situation. Its nearest simile is to be sought in the remaining southern districts of England, particularly in the south-western counties. Some of the analogies and contrasts which they present with it will be pointed out in a parallel between the two climates.

**Main Climatic Sub-varieties.**—A closer analysis of the climate of the whole district detects everywhere an interaction and an intricate dovetailing of the two great influences we have mentioned, the marine and the inland. These are so variously complicated from spot to spot by surface configuration and soil, that the whole area at first appears to be hopelessly broken up into local climates of small districts, of towns, and of individual sites, so diverse as to baffle generalisation. Indeed the accurate description needed for practical purposes inevitably becomes a series of fragmentary local studies such as those appended to each of the local reports. Nevertheless we are able to establish at least a broad distinction between the climate of the south coast and that of the rest.

For the larger inland section a natural contrast can be traced, east and west of the Mid-Kentish hill range, between a bleaker and a more protected region. This also applies to the south coast, the eastern part of which is relatively bleak, presenting warmth and shelter only at selected spots, such as St. Margaret's Bay, Dover, Folkestone, under the immediate protection of the cliffs, which are a distinguishing feature of this part; whilst west of Beachy Head the shelter of the South Downs is substituted for that of the cliffs, the typical south coast climate sets in, and the seaside territory grows wider, until it gradually broadens out into the marine plain of Arundel and Chichester.

**The Special Climatic Districts.**—Analysis may perhaps be safely carried a step further in connection with: (a) Configuration (including exposure and altitude), (b) Vicinity to sea or river, and (c) Geological formation. A study of these elements of climate will probably justify the following classification:

- (1) The North Coast of Kent and its inland territory.
- (2) The Isle of Sheppey.
- (3) The Isle of Thanet.
- (4) The East Coast of Kent and its inland territory, including the Canterbury district.
- (5) The South Coast as far as Eastbourne.
- (6) The South Coast, west of Beachy Head.
- (7) The South Downs " " "
- (8) The "Forests," or Hastings Sands region.
- (9) The Wealden clay area.
- (10) The North Downs.
- (11) The Bagshot sands district, and the Pine country belonging to the Greensand formation.
- (12) The Thames Valley.

Putting aside all finer detail, each of these Sections may be regarded as a climatic unit, and most of them will receive separate consideration. Beyond this point, however, analysis cannot be pushed without splitting up the districts into small and sometimes into minute areas.

#### METEOROLOGY AND GENERAL DESCRIPTION OF THE CLIMATE WITH ANALYSIS OF AND DEDUCTIONS FROM THE TABLES.

The deductions from the meteorological data in hand would be unreliable, or at least incomplete, if they were made to apply to the entire region. Observations taken at such places as Margate, Dover, Brighton, Tunbridge Wells, &c., give us the conditions existing at specially favoured spots which have been singled out for habitation at an early date. All these are picked stations. Many others doubtless exist which have not been discovered, and which might be utilized with untold advantage; but extensive tracts much less hospitable intervene, the climate of which is not hitherto reported upon. Until meteorological stations are established on the North and South Downs, in the



Forests region, in the Kentish weald, &c., we should be drawing from meteorological data taken mainly on the coast very questionable conclusions.

Among the meteorological factors, rainfall and fog are apt to be of local incidence, although not always so. The same remark applies to temperature and to humidity of the air and soil. Wind again, owing to local protection, may locally prevail exclusively in certain directions. In one respect only, that of sunshine, deductions of a general kind are warrantable, owing to the comparative smallness of the region, and to the absence of any elevations above the clouds.

It is therefore obvious that any attempt at a complete description of the instrumental meteorology of the district as a whole would be unprofitable and misleading.

**Temperature of the Air.**—In the chart of mean temperatures of the air for the whole year during twenty years (1861 to 1880) (*Meteorological Atlas*, Plate XXVI.), the entire district is seen to be included, together with a wide horizontal belt which comprises Wales, and the greater part of western England and of southern Ireland, between the isotherms  $50^{\circ}$  and  $51^{\circ}$ .

During the coldest month, January, the mean temperature for the greater part of the region is between  $39^{\circ}$  and  $40^{\circ}$ , the same isotherms ascending north-west along the western coast of Scotland; and during the hottest month, July, the south-eastern district is divided into a southern cooler portion (between isotherms  $62^{\circ}$  and  $63^{\circ}$ ) and a warmer portion between isotherms  $63^{\circ}$  and  $64^{\circ}$ . During this month the temperature of Scotland presents no analogy; and the isotherms from  $61^{\circ}$  to  $64^{\circ}$  occupy exclusively the greater part of England, being arranged concentrically around the small circular area including London and part of the adjacent counties which is surrounded by the isotherm  $64^{\circ}$ .

The map of isotherms further shows that between the mean temperature of the south-east and that of the south-west there is little to choose: the difference is one or two degrees at most to the advantage of the most favoured spots in the south-west.

Indeed the temperature north of St. George's Channel is for some distance on a level with that of the south-east.

Within the district itself the chief contrasts in temperature

occur between the sea coast and inland, relative equability belonging to the former, wide oscillations to the latter. The Sussex coast is the most equable of its regions.

**Character of the Climate at Different Seasons.**—Inland the variations are but slightly different from those of the body of England; but south of the protecting hills, and along the sea coast generally, there is a marked rise in the winter temperature above the main average, with relative equability. For this we may presently find an explanation in the influence of the Gulf Stream.

Extremes of heat and of cold are exceptional, the temperature seldom rising above 90°, and the very severe frosts being generally of short duration. Thus snow may lie on the ground at the warmest of the stations, but the coldest among them will present at times, even in winter, genial sunheat.

Owing to its greater warmth in winter and to its relative coolness in summer, the seaside has a distinct advantage over inland climates. But among the latter good substitutes are found in sheltered situations on dry soil for the winter, and for the summer at bracing stations on elevated ground.

**Influence of Sea-currents and of the Temperature of the Sea upon the Climate.**—The facts set forth in the tables, coupled with the observation that along the east coast of Great Britain the surface temperatures show a somewhat rapidly progressive decline northwards, leave little doubt that the warming influence of the Gulf Stream is continued as far as the mouth of the Thames, and that the cooling influences from the north and from the east do not prevail in any marked degree off the Kentish coast.

To what extent the temperature of the sea may be capable of modifying the temperature of neighbouring land we have no means of ascertaining; but we may assume that the whole district under review (and especially Kent, which presents a long line of northerly sea front) derives appreciable warmth from the Gulf Stream in spite of its relative distance from the latter, and escapes much cooling from the north and from the east, although bathed by the North Sea, which at all other points along the British coast yields lower temperature records than off the Kentish coast.

**Humidity of Air.**—Among the climatic advantages of the



south-eastern district not the least is the relative dryness of its atmosphere. In this respect it compares most favourably with the south-western counties. Considerable local varieties will however be found in its several climates. The driest air invariably coincides with a chalky soil. A striking illustration of this fact may be seen in the chalk-pits in Thanet, where agricultural implements often remain for weeks and months in open caves, almost entirely free from rust or decay. Some of the sandy districts also enjoy considerable dryness of air; but in others impervious substrata retain the moisture, which is apt to rise again in the shape of mists. In the clay districts, in deep valleys, and in the vicinity of rivers considerable humidity prevails; and with the exception of the pine country, the abundance of trees tends in most localities to favour humidity, or to mitigate the dryness, which is not anywhere excessive.

**Fog.**—Inland mists, such as those just referred to, are common enough in connection with subsoil dampness. They rarely if ever assume the proportion of fog. Along the coast fog is an occasional complication, not more common here than in other parts of the marine districts in the track of the Gulf Stream.

**Sunshine.**—Particulars concerning localities will be found in the local reports. Taken as a whole the district possesses a good average, but its local records vary much, the south coast heading the list. This agrees with the conclusions arrived at in *Ten Years' Sunshine in the British Isles, 1881-1890* (published by the authority of the Meteorological Council): "The sea-coast receives more sunshine than the inland parts of the country"; "clouds form inland where the ground rises to hills." The Sussex seaside resorts vie with each other in this respect for the first place.

**Rainfall.**<sup>1</sup>—A study of the rainfall in the south-east of England is full of interest, the separate and the combined influence of the three great factors being very clearly traceable.

Even as late as the Roman period the rainfall in the weald and in the forest regions was excessive, in connection with a densely wooded surface. At the present time vegetation doubtless accounts for a proportion of the rainfall; but the extensive fir plantations occurring here, and in other parts of the district, indicate ten-

<sup>1</sup> See *Meteorological Atlas*, Plate XXVII.

dencies in an opposite direction, and the influence of soil may be recognized in limited districts such as that of Chertsey, where other conditions would seem specially to favour rainfall.

In a region so much exposed to the wet winds, configuration is at once seen to be the leading factor. Nowhere is this better displayed than in the dry districts of Bognor, of the Sussex coast in general, and of the Romney Marsh in contrast with Eastbourne and Crowborough. These important distinctions will receive further consideration in the report on Sussex.

Thanks to the relative dryness of the areas we have mentioned, and of Thanet and the north-east corner of Kent, including the Isle of Sheppey, the district stands as high in respect of small rainfall as any district of equal size within the British Isles. In spite of great local variety, the rainfall is nowhere as considerable as in Devonshire and Cornwall; and in many situations the rain is absorbed or evaporated with great rapidity.

**Wind and Protection.**—The local incidence of wind is the result of local configuration and shelter, and can only be satisfactorily dealt with in connection with the several stations. It may be useful, however, to trace in the orological map the course of the north and north-east wind, and more particularly of the south-west wind, which is the most prevalent of all, and apt to be the most violent.

The exposure of North Kent to the colder winds need not be dwelt on at this stage. The whole of East Kent is subject to the same influence. A good deal of these winds is deflected by the Mid Kent hill range; but this protection is not a continuous one, and the valley of the Stour opens a high road for the Atlantic as well as for the North Sea gales. Ashford is in unenviable proximity to this gap.

The course followed by the south-west wind as it strikes the coasts of Sussex and Kent is peculiar. In Sussex the south-easterly slant of the South Downs and their gradual slope would deflect and ease the violence of storms, until they encountered the cliffs at Eastbourne. Sweeping past the Hastings region, which receives protection from Beachy Head, the south-westerly gale finds a broad open way across the flats of Romney Marsh northwards to Ashford, and along the valley of the Stour to Canterbury and into north-east Kent. Eastwards of Folkestone



the south and the south-west are the only winds which make themselves felt at the foot of the cliffs.

**Vegetation as Evidence of Temperature and Exposure.**

—Nearly all the members of the flora and produce of the British isles will grow in the open in any part of the district, sometimes with, in other cases without artificial protection from prevailing winds. This is not the case with the exotic plants: they only thrive in a limited area to which we shall refer in greater detail, and only under favourable circumstances. The region is that of the Sussex coast protected by the South Downs. Behind the Worthing shore extensive cucumber and tomato plantations are arranged in sunny situations at the foot of the Downs. Fig trees attain considerable luxuriance, and the eucalyptus does well in the open.

These facts are in definite contrast with those observed in parts bathed by the North Sea and unprotected by the Downs. In Thanet, in spite of much light and of good summer heat, even complete shelter will not ensure the vitality of exotics. The same is true of the eastern section of the south coast as far as Brighton.

**Exposure.**—It must be owned that this difference is not to be ascribed exclusively to disparity in temperature. The thermometer shows for instance between the yearly mean temperatures of Ramsgate and Worthing a difference of only  $0^{\circ}25$  which is hardly a sufficient explanation. And again, the temperature of the sea ranges at Penzance from about  $46^{\circ}$  to  $60^{\circ}$ , and at Ramsgate from  $42^{\circ}$  to  $61^{\circ}$ .

Exposure tells more and more the farther east we go. Kent is open to the north and north-east wind from Sheerness to St. Margaret's Bay, where good shelter can be found over a minute area, and where plants flourish which cannot be reared in other portions of East Kent.

The south shore is for a stretch protected by cliffs, but at the same longitudes the land (as for instance at Ashford) is without efficient shelter.

Within the Wealden area the protection from the north is decidedly better, but the coast is still more or less under the influence of the east wind.

The projection of Beachy Head is a protection to the westward; and perhaps to this circumstance may be due some of the differences noticed in the coast vegetation.

Inland, local variations in the indigenous flora are very noticeable; they are a good indication of the varying degrees of protection from place to place.

**Vegetation as Evidence of Moisture of Air and Character of Soil.**—The district under review supplies unusually good opportunities for a study of the relationship of both these factors to vegetation. Moisture of soil and of air is commonly evidenced by the growth of ferns, and moisture of soil by that of bulrushes and willows. Ferns are particularly instructive, since their luxuriance argues moisture, and their endless varieties correspond to a fine scale of temperature.

Here they are not remarkable by luxuriance—and their occurrence is decidedly sporadic. With Devonshire the contrast in this respect is exceedingly marked. This alone is an evidence of relative dryness.

**Soil.**—In this dryness we find varying degrees—to which correspond definite characters of vegetation. Both the vegetation and the dryness are found to be based on differences in soil, of which we distinguish four chief types:—(1) The wealden clay, low lying and moderately damp. (2) The greensand, of varying elevation. (3) The chalk. (4) The London clay.

The last (4) corresponds with the region of the Thames Valley, which gives a fair sample of English vegetation in general.

(2) The greensand area presents two types of vegetation: in high and exposed situations heather and gorse are the chief growth; in low situations or on sheltered heights fir trees abound.

(3) The chalk is distinguished by dryness, and by absolute barrenness, or by fertility for cereals, according to the depth of the soil.

(1) The wealden clay region is productive but uninteresting.

**Influence of Trees.**—Other climatic aspects of vegetation are the influence exercised by tree-growth on the rainfall, and especially the protection from wind afforded by trees.

*Influence on Rainfall.*—In endeavouring to explain the difference in rainfall between the south-west and the south-east districts of England by the nature of soil and the amount and kind of woodland, it must not be forgotten that the atmospheric conditions are widely distinct. The south-west winds, which are



undoubtedly the prevalent ones in the east as well as in the west, bring to the latter an amount of Atlantic moisture which does not in its entirety reach the opposite end of the island. When this has been discounted the remaining difference is too slight to enable us to draw any definite conclusions.

It is however reasonable to attribute to the nature of the woods, which are largely of fir trees, or to their less continuous arrangement, some of the relative immunity from rain enjoyed in many localities.

*Protection Afforded by Trees.*—It is one of the blessings arising from the varied configurations of the south-eastern counties that shelter is multiplied to a very great extent. A great deal of this protection is undoubtedly furnished by trees; but with it the shelter of hills is very often combined. Some of the most undulating regions, such as those of the "Forests" in the Hastings sands, are partly wooded, and numerous other instances might be adduced. Among them need only be mentioned the Haslemere district, that of Weybridge, that of Woking, of Guildford, Box-hill, &c.

It is obvious that the study of these factors is essentially one for local application. With sufficient protection the natural mildness of the air comes into play, and the climate is not only enjoyable for those in health but appropriate for invalids. The duty of this part of the report is merely to indicate the general capabilities of the region, and the manner in which they might be utilized by individual effort.

#### A PARALLEL BETWEEN THE SOUTH-EASTERN CLIMATE AND THAT OF CORNWALL.

In latitude, in its symmetrical position at the other extremity of the south coast, in its general triangular shape, in its three side exposure to the sea, the south-eastern corner of England presents points of striking analogy with Cornwall. Another resemblance arises from the fact that the Gulf Stream bathes both districts at least in part. At the Goodwin Sands and at Margate the sea is nearly as warm as at Penzance; and during the winter it is apt to be at times warmer than the air by several degrees.

But, whereas Cornwall is pre-eminently and almost wholly

Atlantic in its climate, this is not true without much qualification of the south-eastern district. Thus it happens that it is neither as warm, as equable, nor as relaxing as Cornwall, even along the coast. So evenly tempered a district, with variety adapted to every diversity of health requirement, must be to the taste of the majority; and it may be safely stated that it has more friends and admirers than any other part of the British Isles.

Inland the difference is great. We look in vain, in the daily record or especially in the yearly, for that equability which is possessed by Cornwall.

The cause for this contrast is not far to seek. Not only is the distance from sea to sea much less across the Cornish land than in the case of the opposite extremity of England, and therefore the line of coast much longer in comparison to the area, but in the East the northern side of the triangle is partly formed by the estuary of the Thames, and partly bathed by the cold North Sea, both of which are much cooler in winter than the Gulf Stream, which skirts the north as well as the south of Cornwall.

Again, the connection with the main land is much broader in the case of the eastern than in that of the western extremity of England. And the continuity of land, which in Cornwall is exclusively due east, in the other instance is partly westerly, but to a great extent northerly also. The cold north and north-east and east winds, which are mitigated by their passage over temperate regions before reaching Cornwall, are not tempered by any analogous influence in the eastern counties.

Moreover the Gulf Stream, by admixture with a colder element rapidly loses beyond the South Foreland some of its warmth, which is still undiminished at the longitude of Falmouth.

Two opposite climatic influences are thus perpetually alternating or blending with each other in the east—that of the Gulf Stream or the Atlantic influence from the south, and that of the North Sea or the Arctic influence from the north and from the north-east. The nearer we approach the south-east, the more the Arctic tends to predominate. But the change is not simply proportionate to the distance. As previously hinted, a succession of transversely placed ridges break the severity of the northern currents, and we shall see that although the extremity of Kent



is quite open to the east, the east wind is in some measure kept off from the western part of Kent and from Sussex by the moderate altitude which extends in a south-easterly direction and ends at Folkestone.

#### MEDICAL CLIMATOLOGY.

The district is in no climatic sense a homogeneous one, but presents almost every therapeutic variety of the English climates and answers most varied therapeutic needs. It contains some of the most bracing inland and seaside places, and some of the most sheltered and temperate, although not absolutely the warmest stations. These varied advantages of the south-eastern counties, coupled with natural beauty and fertility, acquire unusual importance owing to the neighbourhood of the enormous population of London. It is a growing task for the present and the future to provide for the health requirements of the huge city, and, since its vast population cannot select their sanatoria by distant travel, to develop, if need be artificially, the best advantages that can be found within accessible range.

In a vast number of cases change of any kind is of service, and for these any part of the country might be beneficial, but the south-eastern district contains within easiest reach and nearest to London some of the most eligible climates, whether estuarine, seaside, or inland. The magnitude of the numbers to be provided for, and the general suitability of almost every part of this district for the average requirements of the Londoner, will perhaps justify the amount of detail into which we have entered in dealing with its geological and general features.

In the case of the more delicate invalids, and especially of consumptives, the choice would be restricted to the few places possessing natural shelter; although many others might be made available if their less complete advantages were to be artificially improved.

Meanwhile considerable discrimination must be exercised. In this task geology and meteorology will render us great and welcome assistance; but when instrumental climatology has furnished us with all the information it can give, there remains

to be consulted the finest of all tests, the physiological test, or the reaction of the human constitution to the qualities of the air. Persons travelling rapidly from the Land's End to the North Foreland are conscious of very marked changes in their general condition. Even the passage through the shorter distance from London to Margate brings about a similar if less striking result. The energy is roused, the nervous system is exhilarated, the respiratory function is rendered more active, the skin tightened, the muscles rendered capable of exertion with less feeling of fatigue. All this is, in common language, summed up in the word "bracing," as opposed to "relaxing."

A bracing<sup>1</sup> quality is the common peculiarity of the whole eastern coast from northern Scotland southwards. In the south-east of England this is combined with comparative mildness of temperature and with brilliant sunshine, whilst along the south coast every gradation is found between the bracing and the relaxing type of climate. Although we may fairly describe the climate of the south-eastern corner of England as stimulating in contrast with the south-western counties, this is not equally true of each of its subdivisions, and we have occasion to distinguish the following varieties:

(1) Bracing inland climates, and (2) bracing seaside climates; (3) relaxing inland climates, and (4) relaxing seaside climates; (5) moderately bracing inland climates, and (6) moderately relaxing seaside climates.

The fact is in itself remarkable that so great a variety of climates should be contained within so relatively small an area; and it is still more remarkable that they should be so sharply defined from each other, and yet bound together by the temperateness which is common to all of them. It would be fruitless to attempt to deal with all these as a whole. The general description of the climate and meteorology has been only broadly sketched, and therapeutic details are reserved in connection with the several localities.

**Indications and Contra-indications.**—Famed for the relief of many ailments, the south-eastern district is not the special

<sup>1</sup> There is probably nothing abstract in this quality—it is the sum of several factors combined—but pre-eminently of dryness of air. And this probably tells on the system chiefly by its effect on electrical changes.



home of any. Ague was at one time prevalent along its coast. This one blemish is now almost entirely removed, and, whichever way the traveller may turn his steps, he can enjoy the full trust that his health will encounter no local dangers from nature. Certain risks are almost inseparable from towns, but during the last decennia great progress has been made in urban as well as in rural sanitation; and the results are apparent in the local returns even from the larger towns in the district. For those in strong health, nay, even for many delicate constitutions, there are therefore no general and hardly any local contra-indications. The question merely turns on the relative degree of excellence in a series of good climates.

In disease, or when a marked tendency exists towards certain ailments, the choice is much narrowed, but it remains fairly good. Sufferers from bronchitis, asthma or phthisis, rheumatism and gout, anæmia and dyspepsia, ague and tropical cachexia, will each find some preferable locality, but it will be noticed that most of them converge towards the south coast or towards Thanet.

In comparing the therapeutic value of the inland and of the marine climate of this favoured district, we might almost be tempted to say, "inland is the place to enjoy health, the sea coast to make it." In general all conditions of delicacy, and therefore of irritability of tissues or of functions are best suited by the south coast; whilst torpor in all its forms, and debility associated with nervous depression or loss of tone, are benefited by the quickening influence of the northern and especially of the eastern coast of Kent.

Within the whole district there is but one inland health resort of primary importance—Tunbridge Wells, although the climatic opportunities for health stations are multiple and various.

*Remarks on the Comparative Prevalence of Phthisis in the Districts of Kent, Surrey, and Sussex.*

Special climatological interest attaches to Surrey, Sussex, and Kent owing to this district having been in 1886-7 the field of Sir George Buchanan's investigations in connection with the ætiology of phthisis. Simultaneously with those of Professor Bowditch in

America, they have proved that wetness of soil is the determining cause of the local prevalence of the disease.

At one time the local differences between the mortality returns from phthisis were greater than they are now. They were shown by Sir George Buchanan to be due to local varieties in the dampness of the soil. (See *The Report of the Medical Officer of the Privy Council* (1867)). The phthisis death-rate of the several registration districts in Kent, Surrey, and Sussex was found by him to differ from each other in the following order.

*1. Sheppey,	20. Bridge,	40. Rye,
*2. Hastings,	21. Gravesend,	*41. Brighton,
3. Dartford,	22. East Grinstead,	42. Maidstone,
4. Epsom,	*23. Tunbridge,	43. Cuckfield,
5. Milton,	24. Reigate,	44. Dorking,
6. Godstone,	25. Eastbourne,	45. Uckfield,
7. North Aylesford,	26. Farnham,	46. Hailsham,
*8. Thanet,	*27. Medway,	47. Ticehurst,
9. Dover,	28. Hambleton,	48. Worthing,
10. Bromley,	29. Battle,	49. West Ashford,
11. Steyning,	30. Canterbury,	50. Lewes,
12. Chertsey,	*31. Romney Marsh,	51. Tenterden,
13. Croydon,	32. Hollingbourne,	52. Horsham,
*14. Hoo,	33. Malling,	53. Westhampnett,
15. Cranbrook,	34. East Ashford,	54. Midhurst,
16. Richmond,	35. Sevenoaks,	55. Thakeham,
17. Kingston,	36. Guildford,	56. Petworth,
18. Eltham,	37. Farnborough,	57. Westbourne,
19. Blean,	38. Eastry,	58. Chichester.
	39. Faversham,	

\* The data referring to these districts are less reliable, owing to the number of invalid visitors and to the migratory population.

Since the date of the report, the improved drainage of towns and also of the country districts has considerably equalised the death-rate from phthisis. Nevertheless the table is of interest beyond its historical value, as showing the tendency special to the various localities in connection with the nature of their soil.

The position taken by Sheppey at the head of the list of relative immunity from phthisis justifies us in including in this report a detailed description of this comparatively unknown but climatologically important district. Chertsey also stands high in spite of its vicinity to the Thames; the Bagshot Sands region to which it belongs has also been made the subject of a special report. For a similar reason, Gravesend, although not regarded as a health resort, has been deemed worthy of separate consideration.



THE GENERAL MORTALITY, AND THE MORTALITY FROM SEVERAL DISEASES, IN THE COUNTIES OF LONDON, KENT, SURREY, SUSSEX, AND MIDDLESEX, COMPARED WITH THE MORTALITY FROM THE SAME CAUSES IN ENGLAND AND WALES FOR THE YEAR 1891 (PER MILLION PERSONS LIVING). FROM THE *Registrar General's Annual Report* FOR 1891.

The report on the Medical Climatology of the south-eastern district of England would not be complete without statistics of the mortality from the chief diseases as well as of the mortality from all causes. The annexed tables and the subjoined analysis of the tables have been constructed for the year 1891, which was the year of the Census. It has been deemed best to deal concurrently with the counties of London and Middlesex; for the sake of easier comparison under each of the following readings the figures for each county have been arranged according to their numerical order.

## I.

## THE MORTALITY FROM ALL CAUSES.

*Order of Mortality:—*

Middlesex . . . . .	15,749	
Surrey . . . . .	16,078	
Kent . . . . .	16,203	
Sussex . . . . .	16,545	
England and Wales. . . . .		20,217
London . . . . .		21,112

The mortality for London is the only one surpassing that for England and Wales. In the other counties the mortality is far below the general mortality, being least in Middlesex (327 fewer than in Surrey) and greatest in Sussex (342 more than in Kent). The difference between Kent and Surrey to the advantage of the latter being much less marked (125 only).

## II.

## CANCER.

*Order of Mortality:—*

Middlesex . . . . .	648	
England and Wales. . . . .		692
Surrey . . . . .	709	
Sussex . . . . .	782	
Kent . . . . .	786	
London . . . . .		792

With the exception of Middlesex the counties compare unfavourably with England and Wales; Sussex and Kent almost

equalling the mortality in London. The contrast between these two counties and Middlesex is very remarkable.

## III.

## PHTHISIS.

*Order of Mortality:—*

Middlesex . . . . .	1,244
Kent . . . . .	1,411
Sussex . . . . .	1,487
Surrey . . . . .	1,490
England and Wales . . . . .	1,599
London . . . . .	1,971

Middlesex is again favoured in an astonishing degree, and London shows a very heavy excess over the mortality of England and Wales. That of the three remaining counties is much below the latter, Kent giving a decidedly more favourable return than those from Sussex and Surrey, which are about equal.

## IV.

## DISEASES OF THE RESPIRATORY SYSTEM.

*Order of Mortality:—*

Surrey . . . . .	2,958
Kent . . . . .	2,968
Sussex . . . . .	3,060
Middlesex . . . . .	3,405
England and Wales . . . . .	4,565
London . . . . .	5,306

The mortality in London is a good deal in excess of, but that of the counties is far below, the mortality of England and Wales. In contrast with the returns for phthisis, Middlesex suffers very heavily; and Sussex gives a strikingly worse record than Surrey and Kent, which are nearly equal. The favourable position taken by Surrey in this list, in comparison with the more temperate county of Sussex, is worthy of notice.

## V.

## ANÆMIA, CHLOROSIS, AND LEUCOCYTHÆMIA.

*Order of Mortality:—*

Middlesex . . . . .	20·66
London . . . . .	37·66
Surrey . . . . .	38·25
Kent . . . . .	50·68
England and Wales . . . . .	53·57
Sussex . . . . .	66·53

It is strange to find London almost on an equality with Surrey, and much in advance of England and Wales. The returns from Middlesex are by far the most favourable, and from Sussex



by far the most unfavourable; Kent is only slightly better than England and Wales.

VI.  
RACHITIS.

*Order of Mortality:—*

Surrey . . . . .	22·60	
Sussex . . . . .	39·55	
England and Wales . . . . .		46·21
Kent . . . . .	46·97	
London . . . . .		61·11
Middlesex . . . . .	63·72	

Surrey shows to great advantage, giving less than half the mortality-rate of England and Wales. Sussex is also well below the same standard, which Kent only slightly exceeds. The mortality in London is nearly one fourth higher than in England and Wales, but the highest proportion is found in Middlesex, which suffers nearly three times more heavily than Surrey.

VII.  
DISEASES OF THE URINARY SYSTEM.

*Order of Mortality:—*

Surrey . . . . .	419	
Middlesex . . . . .	424	
Kent . . . . .	445	
Sussex . . . . .	457	
England and Wales . . . . .		468
London . . . . .		563

With the exception of London, which shows an excess of nearly one fifth the figures present no very remarkable differences. Surrey and Middlesex have a low mortality, Kent an intermediate one, and Sussex a relatively high mortality, which however is well below the general rate for England and Wales.

VIII.  
ACUTE NEPHRITIS.

*Order of Mortality:—*

Kent . . . . .	37·08	
Middlesex . . . . .	39·61	
Sussex . . . . .	44·95	
Surrey . . . . .	45·21	
England and Wales . . . . .		61·89
London . . . . .		68·93

None of the four counties present more than three-quarters the death-rate for England and Wales, which London exceeds a good deal. Kent and Middlesex have less than two-thirds, and Sussex and Surrey rather less than three-quarters, of their proportion of deaths, reckoned on the scale belonging to England and Wales.

IX.  
BRIGHT'S DISEASE.

*Order of Mortality:—*

Surrey. . . . .	208·66	
Kent . . . . .	241·07	
Sussex. . . . .	244·54	
Middlesex . . . . .	258·35	
England and Wales . . . . .		258·89
London . . . . .		326·19

Surrey stands high in relative immunity, Middlesex has almost the same mortality as England and Wales, whilst Kent and Sussex, with a small disparity, are well under the ratio. London shows a great excess over the latter.

X.  
CALCULUS.

*Order of Mortality:—*

Kent . . . . .	7·41	
England and Wales . . . . .		8·14
Sussex . . . . .	8·99	
Surrey. . . . .	10·43	
Middlesex . . . . .	12·05	
London . . . . .		14·21

Kent alone stands above England and Wales in relative immunity, its mortality being only about half that of London, and markedly less than the Sussex, Surrey, and Middlesex mortality which grows up to the maximum found in London, by equal successive increments, the difference between each being equal to one seventh of the maximum.

XI.  
RHEUMATIC FEVER AND RHEUMATISM OF THE HEART.

*Order of Mortality:—*

Kent . . . . .	81·59	
Middlesex . . . . .	84·39	
England and Wales . . . . .		87·58
Sussex. . . . .	89·89	
London . . . . .		91·91
Surrey. . . . .	100·85	

The unfavourable position taken in this list by Surrey is very remarkable, the excess over the rate for London being almost equal to the total range of difference between Kent and the metropolis. Kent stands decidedly high, above Middlesex and above England and Wales. The mortality of Sussex is intermediate between that of England and Wales and that of London.



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### III.

#### RESPIRATORY.

<i>Order of Mortality—</i>	
Middlesex	27.55
London	28.12
Kent	28.45
England and Wales	36.89
Sussex	37.73
Surrey	42.47

Surrey again suffers heavily, Sussex being only a little worse off than England and Wales. At a much higher level, Kent and London have the same rate, and Middlesex has a perceptible advantage over them.

### VIII.

#### GOUT.

<i>Order of Mortality—</i>	
England and Wales	22.45
London	35.24
Kent	38.32
Sussex	55.74
Surrey	69.45
Middlesex	62.72

The general mortality in England and Wales is far below that of the district under study. London follows at a long distance; its mortality being exceeded by that of the counties.

It is noteworthy that Kent approaches London in relative immunity, and distances Sussex by a considerable interval. Sussex has much more than twice, and Middlesex has nearly three times the mortality of England and Wales, the Surrey mortality being nearly intermediate between these two values.

### The Counties Reviewed Separately.

**Middlesex.**—Strange and unexpected facts are revealed by the tables of mortality, and in this respect Middlesex occupies the front rank. With a moderate mortality from diseases of the respiratory organs in general it presents a smaller death-rate from phthisis than any of the three other counties. The mortality from anemia is also very low. Cancer has a moderate death-rate. On the other hand the mortality from rickets is extraordinarily high, exceeding even that for London.

Again under the headings "Rheumatism, Rheumatic Fever, and Rheumatic Gout," the returns are low. Gout, on the contrary, is accountable for many deaths in excess of the mortality elsewhere in the South-eastern district.

The diseases of the urinary system yield a low mortality, as well as acute nephritis; but chronic Bright's disease makes more victims in Surrey than elsewhere, except London. The mortality from calculus is also relatively high.

**Surrey.**—Deaths from diseases of the respiratory system in general are here at a minimum; phthisis yielding a medium mortality. There is relatively very little fatal rickets, and little fatal anæmia. Cancer is of average frequency.

Surrey also gives the smallest mortality return in respect of diseases of the urinary system in general, and of chronic Bright's disease, and medium values in respect of acute nephritis and of calculus.

Rheumatism, rheumatic fever with heart disease, and gout are all very prevalent, judging from their death-rate.

**Sussex.**—The mortality from diseases of the respiratory system is low, that from phthisis relatively high. There is a good deal of fatal rickets. The death-rate from cancer is high, notably also that from anæmia.

Diseases of the urinary organs cause more deaths than in any other of the counties in this group; acute nephritis, chronic Bright's disease, and calculus reaching rather high averages.

Rheumatism, rheumatic fever with heart disease, and gout have rather high death-rates.

**Kent** yields a small death-rate from diseases of the respiratory organs and from phthisis; a medium death-rate from rachitis, and a rather high one from anæmia. Cancer is of frequent occurrence.

Rheumatism is relatively not often fatal; the fatality of rheumatic fever with heart complication is less than in any other member of the group; and that of gout is less than in the counties, although not less than in London.

Diseases of the urinary system have a medium mortality, and that due to Bright's disease is relatively small. Calculus is less fatal, and acute nephritis is much less fatal than in the other members of the group.

**Concluding Remarks.**—An obvious explanation may be suggested for the higher death-rate from anæmia in Sussex, connected with the local prevalence of ague; but why is it so low in London and Middlesex?



The small death-rate from diseases of the respiratory system and from phthisis in Surrey and in Kent would have surprised had the returns related to the coast alone. It is so in itself, and also in association with the greater mortality from phthisis in Sussex.

No explanation is at hand for the remarkably small mortality from phthisis, nor for the remarkable mortality from rheumatism in Middlesex; nor again for the remarkably small mortality from rickets in Surrey. The fatality of gout, coupled with the non-fatality of rheumatic affections in Middlesex, is in contrast with the returns from Surrey and Sussex, where these go hand in hand as regards mortality. Another unusual fact is the greater immunity of Kent as regards rheumatism, heart disease, and in a less degree as regards gout.

The most striking fact is perhaps the much smaller mortality from acute nephritis and from calculus enjoyed by Kent.

The high death-rate from chronic Bright's disease in Kent is probably correlated with that from gout. The small mortality from the same cause in Surrey remains unexplained.

Again, why should the mortality from urinary diseases in general be greatest in Sussex?

The prevalence of cancer in Sussex and in Kent remains an unsolved problem.

ANNUAL DEATH-RATES FROM VARIOUS DISEASES PER 1,000, DURING THE YEARS, 1871-1880, FROM THE SUPPLEMENT TO THE 45TH ANNUAL REPORT OF THE REGISTRAR-GENERAL.

	England and Wales.	Surrey (Extra Metropolitan).	Kent (Extra Metropolitan).	Sussex.	Middlesex (Extra Metropolitan).	Thanet.	East of England.
Annual Death-rate per 1,000.	21.27	16.77	17.81	17.05	—	18.97	17.00
Cancer . . . .	0.47	0.48	0.48	0.57	—	0.66	0.40
Scrofula . . . .	0.13	0.10	0.13	0.13	—	0.27	0.10
Phthisis . . . .	2.12	1.91	1.83	2.05	—	1.70	1.80
Diseases of the Respiratory System . . . .	3.76	2.63	2.82	2.65	—	2.64	2.80
Diseases of the Urinary System . . . .	0.39	0.45	0.41	0.43	—	0.48	0.40

CAUSES OF DEATH IN REGISTRATION COUNTIES, 1891. From the REGISTRAR-GENERAL'S FIFTY-FOURTH ANNUAL REPORT FOR 1891, P. 142 ET SEQ.

	ENGLAND AND WALES.	DIVISION I. LONDON.	Part of Division II. (South-eastern Counties).			Part of Division III. S. Midland Counties. MIDDLESEX.
			SURREY.	KENT.	SUSSEX.	
Rheumatic Fever, Rheumatism of Heart . . . . .	{ M. 1278 F. 1269 2547=87.58	176 212 388=91.91	34 24 58=100.85	33 53 66=87.59	28 22 50=89.89	24 26 40=87.59
Rheumatism . . . . .	{ M. 494 F. 573 1067=36.69	39 61 190=28.42	14 11 25=43.47	13 10 23=28.43	7 14 21=37.76	6 10 16=27.55
Gout . . . . .	{ M. 521 F. 182 653=22.45	180 23 163=36.24	26 9 35=60.85	6 7 13=38.32	25 6 31=55.74	28 9 37=63.72
Rickets . . . . .	{ M. 714 F. 580 1344=46.21	161 97 258=61.11	6 7 13=22.60	28 10 38=69.97	13 9 22=39.55	21 16 37=63.72
Anæmia, Chlorosis, Leucocythæmia . . . . .	{ M. 558 F. 1000 1568=53.57	72 87 159=37.66	7 15 22=38.25	11 30 41=50.68	14 23 37=66.53	6 6 12=20.66
Acute Nephritis . . . . .	{ M. 1044 F. 756 1800=61.89	180 111 291=68.93	14 12 26=45.21	14 16 30=37.08	14 11 25=44.95	11 12 23=39.61
Bright's Disease . . . . .	{ M. 4067 F. 3462 7529=25.89	748 629 1377=36.19	68 57 120=208.66	109 86 195=241.07	78 58 136=244.54	73 77 150=258.35
Calculus . . . . .	{ M. 176 F. 61 237=8.14	44 16 60=14.21	5 1 6=10.43	6 0 6=7.41	3 2 5=8.99	8 4 7=12.05
POPULATION (Census 1891).	20,081,047	4,221,452	575,078	808,872	556,186	580,607

The percentages (in *italics*) are reckoned *per million* of the population, from the figures supplied in the Report (in ordinary type).



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DEATH-RATES FROM SEVERAL CAUSES IN REGISTRATION COUNTIES, 1891.  
(Per Million Persons living.)

*From the Registrar-General's Annual Report for 1891.*

	England and Wales.	London.	Surrey.	Kent.	Sussex.	Middlesex.
Deaths from all } causes ... ..	20,217	21,112	16,078	16,203	16,545	15,749
Cancer ... ..	692	792	709	786	782	648
Phthisis ... ..	1,599	1,971	1,490	1,411	1,487	1,244
Diseases of the Re- } spiratory System }	4,565	5,306	2,958	2,963	3,060	3,405
Diseases of the } Urinary System }	424	457	445	419	563	468
Population ... ..	29,081,047	4,221,452	575,078	808,872	556,136	580,607

## THE CLIMATE OF SURREY.

By WILLIAM EWART, M.D., F.R.C.P.

**Boundaries and Divisions.**—The western boundary of Surrey begins above Magna Charta Island, and keeping close to the eastern boundary of Windsor Great Park and crossing Virginia Water, part of which belongs to Berkshire, it passes to the east of the Bagshot Hills between Bagshot Heath and Bagshot Park. Leaving the Chobham Ridges a little to the west, the line approaches Farnborough and Aldershot Camp Station, and runs westward south of Aldershot as far as Beacon Hill. Turning southwards once more it crosses Farnham Common and ends a little west of the Devil's Punch Bowl and of Haslemere.

The southern Surrey boundary runs almost due east from Haslemere to a point north by east of East Grinstead.

The eastern boundary lies north and south between East Grinstead and Anerley.

The northern boundary follows the very sinuous bends of the river Thames from Magna Charta Island to the western approach of Putney, and from Putney it extends as far as Anerley. Beyond this point Barnes, Mortlake, East Sheen, Beverley Brook in Richmond Park, Wimbledon Common, New Wimbledon, Merton, Tooting, Mitcham, Norbury, Lower Streatham, Gibson Hill and Upper Norwood, all included in Surrey, form in succession the border between this county and the county of London.

Southward to East Wickham, and subsequently with irregular outline and a main direction south-west, the boundary skirts Shooter's Hill, Blackheath, Eltham, Grove Park, Sydenham, the Crystal Palace, Anerley and Penge, all within the county of London; and from this point it extends due south as far as Bearden.



Purely for the sake of description Surrey may be divided into a northern and a southern section separated by the downs, each section being subdivided as follows:—

**A.—Surrey North of the Hills:—**

I. A western sub-district includes the Chobham Hills and their valley as far as the Wey (Chertsey lies close to the river). The South-Western Railway passes through Woking, Worplesdon and Guildford, and the Basingstoke branch of the South-Western Railway passes through Brookwood to Farnborough.

II. Between the Wey and the Mole the higher ground slopes down to the Thames from Merrow, Effingham, &c. Nearer the Thames we notice Weybridge, Walton-on-Thames, East Moulsey.

III. Between the Mole and Barnes we distinguish a riverside district with Long Ditton, Kingston, Richmond, Kew, Mortlake, Barnes, &c., and a higher lying district between Chobham and Epsom. East of this are the Epsom and Banstead Downs.

IV. Between Barnes and the Ravensbourne (at Greenwich) there are low heights such as Wimbledon, Wandsworth, Norwood, Sydenham; and further south, Croydon, Addington, and on the downs Merstham and Westerham.

**B.—Surrey South of the Hills:—**

V. A south-western subdivision is included between the Hampshire border and the railway line to Horsham.

VI. The Leith Hill district lies between the two railway lines to Horsham; and lastly

VII. The Boxhill and Betchworth district, between the railway from Dorking to Horsham and the Brighton line, may be taken together with the south-eastern corner of Surrey extending between the Brighton railway line and the Kentish border.

#### GENERAL DESCRIPTION.

**General Geology and Configuration.**—The quadrilateral area of Surrey is divided from north to south into four successive geological zones.

(1) London clay extends along the Thames the whole way from Windsor to Greenwich; but at the western extremity it is encroached upon (across the Berkshire and Hampshire borders) by an extensive sand deposit, commonly known as the "Bagshot Sands."

(2) The chalk hills or North Downs and their plateaux occupy the zone immediately south of the London clay.

(3) From the height of the North Downs a somewhat sudden drop brings us to the next zone, that of the Greensand, which also extends straight across the county, broadening out in the west between Farnham and Haslemere, and coming within a short distance of the zone of London clay, so that between these two zones only a thin wedge of chalk intervenes.

(4) Lastly, the zone of wealden clay, tapering somewhat in a westerly direction, comes to an end close to Haslemere, and fails to reach the border.

(5) Only a very small triangular patch of Hastings sands is included within Surrey at its south-east corner.

**Physical Characters and General Climatology.**—The London clay district of Surrey partakes of the general physical characters of the Thames Valley. It is intersected by numerous small rivers and streams, separating small hills, or mere undulations.

London and its suburbs fills its eastern extremity, Richmond Park occurs half-way, Egham and Windsor Great Park occupy its north-westerly corner. Vegetation is therefore excluded from its eastern end, but freely represented at other parts.

The region of the Bagshot sands presents a marked contrast with the clay district which surrounds it in Surrey. Its chief features are the bolder elevations known as the Chobham Ridges, the nature of the soil, and the predominance of firs, to which it owes its name of the pine country. It will be described in greater detail below.

The southern boundary of the clay district passes through Croydon, Sutton, Epsom, Leatherhead, Stoke near Guildford, and Farnham.

In the zone of chalky formation the ground begins at once to rise and quickly reaches a fair elevation, which culminates towards the south in heights overlooking the weald. The general features of this district are the same as those of its extension into Kent, which have been described elsewhere (see Kent). Duller and colder tints in the landscape, suggestive of the bleakness of the climate, relative scantiness of vegetation, with fewer trees and less luxuriance of foliage, and an absence of water, except where a river cuts a deep groove through the chalk, are its most striking characteristics. Epsom Downs, Sutton Common, Banstead Common



Box Hill, the Merrow Downs, are familiar names which will recall to many the sterner beauties of this section of Surrey. The most important feature of the chalk formation relating to surface configuration is the abrupt fall or escarpment of the chalk hills towards the weald.

The belt of greensand, for in east Surrey this zone is less than four miles in width, has an altitude intermediate between those of the North Downs and of the clay district of the weald, and here and there rises into rather important hills. The mild and picturesque charm of its scenery is equally distinct from the barrenness of the chalk region and from the luxuriant verdure of the valley of the Thames. Between Dorking and Leith Hill its breadth is more than doubled, and continues to increase towards the western Surrey border. At the same time the surface becomes more and more undulating, and furnished with a more abundant tree-growth, in which the pine predominates. It is traversed by small rivers and streams, derived from the weald, which make their way towards the Thames. Over the whole area the North Downs bestow considerable shelter from the north; and it possesses within itself multiplied elements of protection from wind, thanks to its varied configuration and to its woods.

The plain or valley of the wealden clay supplies yet another change in the varying Surrey landscape. This is the only exclusively agricultural district in the county. It does not contain any town of importance, and hardly any striking feature disturbs its monotony.

**The Climatology of the Surrey Districts in the Vicinity of London.**—The North Downs, which form a segment of a circle of which London is the centre, and a line drawn through Ashted, Epsom, Sutton, Croydon, and Chislehurst and Bexley in Kent, will roughly include what might be called the Surrey hill country, for the most part an exposed and somewhat bleak district of chalk formation, but very bracing and dry. Another line drawn through Wimbledon, Streatham, Norwood, Eltham, and Woolwich would mark off a second zone which is in all respects intermediate between the first district and the valley of the Thames. Within this second zone are many high and bracing places, such as Norwood Hill, with climates widely different from the climate of places like Richmond Hill, Barnes Common, Putney Heath, and Clapham Common, sometimes described as bracing

localities, a qualification to which they can hardly lay claim, though they afford fresh air and are probably salubrious. In any case there is sufficient difference to justify the distinction in the three zones described. This may be illustrated by the climates of Walton Heath, Coulsdon, Warlingham, &c., in the first zone, Norwood in the second, and the various commons near the Thames in the third.

#### THE DISTRICTS IN SURREY IN MORE DETAIL.

**A.—Surrey North of the Hills.**—I. *The district of West Surrey, between the Chobham Ridges and the Wey.*—The north-west corner of Surrey, bounded to the east by the Wey, is a well-defined district, with hills to the west (the Chobham Ridges), to the north-west (those of Bagshot Heath), and to the south (the North Downs), whilst the Thames forms the north-eastern boundary.

From the various heights which have been mentioned the view stretches over an extensive undulating plain, intersected by numerous streams, by the Basingstoke Canal, and by the branching lines of the South-Western Railway. Egham and Chertsey are the only riverside towns.

Between Chobham and the Chobham Ridges (distant 3 miles) lie Bisley and Knap Hill and Bisley Common. Brookwood is on the Basingstoke branch line from Woking. The main line to Guildford, and the branch from Guildford to Aldershot and Farnham, also afford opportunities to the traveller for cursory views of the country.

As regards its geology this district is thoroughly individualised. Between Farnham and Guildford the chalk line is almost reduced to the thickness of the hills. The remaining area is nearly monopolised by an extensive bed of Bagshot sands, which is included between the northern and southern limbs of the London clay deposit diverging along the Thames and the North Downs respectively.

The vegetation presents the characteristics special to a sandy soil. Fir-trees abound.

II. *The district between the Wey and the Mole.*—On the banks of the Thames we notice Weybridge, Walton, and East Moulsey.

The ground is mostly of fair elevation except close to the river. Its hilly nature in the south is evidenced by the names Merrow Downs, Knowl Hill, Hackhurst Downs; and farther



north are found Queen Ann's Hill, and St. George's Hill the highest point in the Bagshot Sand area.

The chalk extends about a quarter of the distance to the river. A belt of London clay and one of Bagshot sands cover almost the entire remaining distance; but a narrow strip of London clay runs along the river side.

The upper part of Weybridge and Byfleet are on Bagshot sand. The section of the North Downs comprised between the Wey and the Mole is perhaps the most picturesque portion of the Surrey hills. An old disused road running along the heights from Ranmore Common to Guildford affords to the pedestrian a series of lovely views, together with bracing air. From Ranmore Common the country gradually descends towards the Thames, about 10 miles to the north, and in this district are Bookham and Effingham at high elevations; Byfleet, Cobham, Weybridge, and Oatlands Park at a lower level. There are many desirable situations to be found here. A sandy soil and quantities of fir trees affording sheltered spots confer upon this district a mild, fairly dry climate, soothing to irritable chests, and well suited for those needing to escape the keen winds of early spring.

III. *The district between the Mole and Barnes.*—Thames Ditton, Surbiton and Kingston, Hampton Court, Richmond, Kew, Mortlake, East Sheen, and Barnes are towns and villages along this very sinuous portion of the Thames.

Richmond Park is hilly, but there is little undulation of the ground over the clay district, which extends north of Leatherhead, Epsom, and Ewell as far as the river.

The remainder is all chalk and hilly. Boxhill and Walton-on-the-Hill belong to this district; and the Epsom and Banstead Downs constitute a well-defined climatic area, where moderate elevation is combined with a dry, bracing air.

The Epsom Downs are continuous with the ridge ending at Boxhill, and extending in an easterly direction past Redhill, Reigate, &c., into Kent.

Northwards from Dorking the Mole runs by Leatherhead, Stoke D'Abernon, and Esher to the Thames at East Moulsey, opposite Hampton Court. The valley of the Mole and the valleys of all the rivers in the South of England possess moist, relaxing climates not suitable for invalids, though of course numbers of people who live in them enjoy the best of health.

IV. *The district between Barnes and the Ravensbourne (Greenwich).*

—South of the metropolitan area (which will be separately described, and which contains no greater elevations than Wandsworth Common, Streatham Hill, Herne Hill, Tulse Hill, and Greenwich) we find the moderate heights of Wimbledon and Upper Norwood. Croydon lies at the extremity of the Chipstead and Smitham range. North of Croydon down to the banks of the river Thames London clay forms the subsoil. South of Croydon the ground is high and chalky as far as the North Downs.

**The North Downs.**—From the Surrey border, near Aldershot, the North Downs extend due east uninterruptedly as far as Guildford, and present the central elevation of the Hog's Back (504 ft.). Beyond the Wey they rise again under the name of the Merrow Downs (530 ft.) and Hackhurst Downs (744 ft.), and follow the same direction till they approach Dorking and the valley of the Mole. From Boxhill, on the opposite side of the Mole, one may travel north-east along the ridges of the Surrey hills above Betchworth, Reigate, and Redhill, by Walton Heath, Gatton, across the Merstham Valley, which runs from Redhill to Croydon to Alderstead Heath, then along by Caterham, Woldingham, Tatsfield, into Kent to Knockholt and to Farningham, until one reaches the valley of the Darent, which runs here through Dartford to the Thames near Erith.

**B.—Surrey South of the Hills.**—This is a long narrow strip stretching from east to west and conveniently divided into three sections by the railway lines which run south.

The Betchworth, Redhill, and Godstone district, or southern portion of the eastern division of Surrey, extends from Dorking to Tatsfield, and is traversed (through Merstham, Redhill, and Horley) by the Brighton line, and (through Woldingham, Oxtead, and Lingfield) by the branch to East Grinstead and Lewes.

The Leith Hill district is part of the western division, and is comprised between the railway lines from Dorking and from Guildford respectively to Horsham.

The Godalming and Haslemere district, traversed obliquely by the railway line joining these two towns, is also part of the western division, and forms the south-west corner of Surrey.

V. *The Betchworth, Redhill, and Godstone District.*—This is the least picturesque of the three subdivisions, though it is not



wanting in charm. The geological arrangement is of the same order as that of the other two subdivisions, but the clay preponderates, and the belt of lower greensand upon which are situated Betchworth, Reigate, and Redhill, Nutfield, Bletchingley, Tandridge, Oxted, and Limpsfield, is considerably narrower than in its western portions. The gault and upper greensand are, as elsewhere in Surrey, reduced to a mere strip. Upon this lies Merstham, part of Redhill and Buckland near Box Hill, the southern slope of which is slightly encroached upon by the deposit. At the extreme south-east corner of Surrey the Hastings sand deposits makes its appearance at Beacon Heath, being continued from the large deposit in Sussex.

To the Leith Hill range there is in this district no strict analogue. Tilburstow Hill (591 feet), between Bletchingley and Tunbridge, and Crockham Hill, which begins just within the Surrey border, stand out in the map as its solitary and distant representatives. Nevertheless the elevation is good all along the lower greensand, varying from 450 to 550 feet above the sea level. The sandy hillocks of Redhill and Reigate may be regarded as belonging to the same system.

The remaining and larger portion of the district is made up by the entire width of the wealden belt of clay. The country consists of a freely undulating plain drained by abundant streams, tributaries of the Mole, and eastward of Tilburstow Hill by those of the Medway. The Mole between Dorking and Boxhill is lost to view for a short distance and runs a subterranean course.

This part of Surrey is remarkable for the number and extent of its commons. From a climatic standpoint those of Earlswood, Redhill, and Reigate, possessing a sandy subsoil, specially deserve notice. Their climate is dry and bracing. No other town of importance occurs in this district.

VI. *The Leith Hill district* is almost evenly divided by the secondary hills of the lower greensand into a hilly section and the plain of the wealden clay. The boundary line between the two formations passes across Leith Hill itself, the southern slope of which is clay. Clay extends also to the north for a short distance east of Leith Hill over the area of Holmwood Common; but Dorking is on the lower greensand. Between the North Downs and the lower greensand the narrow strip of gault and upper greensand suffers no interruption across Surrey. The sandy valley is

drained by a tributary of the Wey, the clay district by the tributaries of the Mole.

The beauties of this part of Surrey are probably unparalleled. They are combined in most places with climatic conditions equal to its attractions. There is no large town to describe. Shalford, Albury, Shiere, Gomshall, and Wotton occur in succession from west to east at the foot of the downs, and Dorking lies in the broad gap in the North Downs produced by the valley of the Mole.

About four miles west of Dorking, between Leith Hill and Holmbury Hill, occurs a picturesque valley covered with pine-woods. The village of Feldday, locally known as Holmbury-St.-Mary (formerly the residence of Sir William Bowman), lies, as it were, lost in the woods; the whole resembles a choice piece of Alpine scenery transplanted into Surrey.

From Holmbury Hill, almost equal in height to Leith Hill, a fine view is obtained, taking in a small bit of the sea

VII. *The Godalming and Haslemere District.*—This district is almost entirely Lower Greensand, and of good elevation, the secondary drop into the wealden clay being marked by the Hambledon and Hascombe range. South of this range, and between it and Sussex, there intervenes but a narrow strip of clay, including Chiddingfold, Dunsfold, and Aldfold. North of this same range the high plain of Farnham and Godalming is drained by the Wey, which at Tilford passes at an equal distance from Crooksbury Hill to Kettlebury Hill in the midst of extensive fir plantations. Viewed from any part of this plain these give a wild and solemn character to the scenery; whilst hills more or less hazy with distance meet the gaze. Here again, as north of the downs, the aspect and the vegetation are those special to a sandy soil.

#### GENERAL METEOROLOGY OF SURREY.

Owing to the grouping of the meteorological stations of Surrey in its northern part within the London clay region, data are not forthcoming from the other districts, a deficiency the more to be regretted as the latter are climatologically more interesting, and therapeutically more important, than the region adjoining the valley of the Thames.



Deductions from the tables cannot therefore be applied to the whole county, and its comparative meteorology can be dealt with only in very general terms.

**The Temperature of the Air.**—The annexed meteorological returns for Norwood, Croydon, and Beddington, extracted from Mr. Francis Campbell Bayard's Paper on English Climatology for 1881-90, show for the three stations a relatively high mean temperature for the whole year (at 9 a.m.)—viz.,  $49^{\circ}1$ ,  $48^{\circ}7$ ,  $48^{\circ}8$  respectively—as compared with the highest record,  $51^{\circ}2$  (at Ilfracombe and Guernsey), and with the lowest,  $45^{\circ}4$  (at Buxton and Cheadle). The mean minimum is far below such extreme values as  $46^{\circ}9$  (Ilfracombe) and  $49^{\circ}9$  (Guernsey); but the respective figures  $42^{\circ}1$ ,  $41^{\circ}8$ ,  $40^{\circ}7$  compare favourably with those of Great Britain in general, and especially with the lowest record,  $37^{\circ}7$  (Buxton). The mean maximum is decidedly high ( $56^{\circ}2$ ,  $55^{\circ}7$ ,  $56^{\circ}0$  respectively) in comparison with the lowest record  $51^{\circ}6$  (at Buxton), and with the mean maximum at Portsmouth,  $57^{\circ}0$ .

We may conclude from these values, but more especially from the returns for the several months which show greater relative warmth in winter and slightly less relative heat in the summer than at many other inland stations, that the less oppressive summer-heat and the less sustained winter-cold are mitigations due to valley influences and to the influence of a not far distant sea.

Of the chalk district it may be said in general that any parching heat is obviated by the high elevation and by the atmospheric interchange between the lower lands which it separates.

Had records been forthcoming from the weald it would have been interesting to search for any indications of a tempering influence from the sea. The fairly level belt of wealden clay affords a broad and almost unobstructed highway for atmospheric currents between the open coast of Pevensey and the foot of the North Downs.

Another interesting comparative study is reserved for the future—that of the respective temperatures of the two sections of pine country, north and south of the Downs, the Bagshot sand area, and the districts of Leith Hill, Godalming, and Haslemere.

**Sunshine and Fog.**—The mean amount of cloud (9 a.m.) at Norwood, Croydon, and Beddington ( $6^{\circ}9$ ,  $7^{\circ}4$ ,  $6^{\circ}9$  respectively) is

METEOROLOGICAL OBSERVATIONS AT NORWOOD, CROYDON, AND BEDDINGTON IN SURREY.  
 Extracted from the paper on "English Climatology, 1881-90," by Francis Campbell Bayard, Esq., F.R. Met. Soc.

Station.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
Mean temperature, 9 A.M. ....	37.5 Norwood ..... Croydon ..... Beddington ...	38.3 Norwood ..... Croydon ..... Beddington ...	40.7 Norwood ..... Croydon ..... Beddington ...	46.8 Norwood ..... Croydon ..... Beddington ...	54.7 Norwood ..... Croydon ..... Beddington ...	60.0 Norwood ..... Croydon ..... Beddington ...	63.1 Norwood ..... Croydon ..... Beddington ...	61.6 Norwood ..... Croydon ..... Beddington ...	57.1 Norwood ..... Croydon ..... Beddington ...	48.3 Norwood ..... Croydon ..... Beddington ...	43.5 Norwood ..... Croydon ..... Beddington ...	37.5 Norwood ..... Croydon ..... Beddington ...	49.1 Norwood ..... Croydon ..... Beddington ...
Mean minimum tem- perature ..... at 9 A.M. ....	34.0 Norwood ..... Croydon ..... Beddington ...	34.6 Norwood ..... Croydon ..... Beddington ...	34.6 Norwood ..... Croydon ..... Beddington ...	38.4 Norwood ..... Croydon ..... Beddington ...	44.2 Norwood ..... Croydon ..... Beddington ...	50.1 Norwood ..... Croydon ..... Beddington ...	53.2 Norwood ..... Croydon ..... Beddington ...	52.3 Norwood ..... Croydon ..... Beddington ...	49.4 Norwood ..... Croydon ..... Beddington ...	42.1 Norwood ..... Croydon ..... Beddington ...	38.9 Norwood ..... Croydon ..... Beddington ...	33.8 Norwood ..... Croydon ..... Beddington ...	42.1 Norwood ..... Croydon ..... Beddington ...
Mean maximum tem- perature ..... at 9 A.M. ....	42.8 Norwood ..... Croydon ..... Beddington ...	44.3 Norwood ..... Croydon ..... Beddington ...	48.3 Norwood ..... Croydon ..... Beddington ...	54.3 Norwood ..... Croydon ..... Beddington ...	62.5 Norwood ..... Croydon ..... Beddington ...	68.1 Norwood ..... Croydon ..... Beddington ...	71.2 Norwood ..... Croydon ..... Beddington ...	70.1 Norwood ..... Croydon ..... Beddington ...	65.1 Norwood ..... Croydon ..... Beddington ...	55.6 Norwood ..... Croydon ..... Beddington ...	49.2 Norwood ..... Croydon ..... Beddington ...	42.7 Norwood ..... Croydon ..... Beddington ...	56.2 Norwood ..... Croydon ..... Beddington ...
Mean temperature ....	38.4 Norwood ..... Croydon ..... Beddington ...	39.5 Norwood ..... Croydon ..... Beddington ...	41.4 Norwood ..... Croydon ..... Beddington ...	46.4 Norwood ..... Croydon ..... Beddington ...	53.3 Norwood ..... Croydon ..... Beddington ...	59.1 Norwood ..... Croydon ..... Beddington ...	62.2 Norwood ..... Croydon ..... Beddington ...	61.2 Norwood ..... Croydon ..... Beddington ...	57.2 Norwood ..... Croydon ..... Beddington ...	48.9 Norwood ..... Croydon ..... Beddington ...	44.1 Norwood ..... Croydon ..... Beddington ...	38.2 Norwood ..... Croydon ..... Beddington ...	49.2 Norwood ..... Croydon ..... Beddington ...
Mean relative humid- ity at 9 A.M. ....	90 Norwood ..... Croydon ..... Beddington ...	87 Norwood ..... Croydon ..... Beddington ...	81 Norwood ..... Croydon ..... Beddington ...	75 Norwood ..... Croydon ..... Beddington ...	69 Norwood ..... Croydon ..... Beddington ...	70 Norwood ..... Croydon ..... Beddington ...	70 Norwood ..... Croydon ..... Beddington ...	73 Norwood ..... Croydon ..... Beddington ...	80 Norwood ..... Croydon ..... Beddington ...	85 Norwood ..... Croydon ..... Beddington ...	90 Norwood ..... Croydon ..... Beddington ...	89 Norwood ..... Croydon ..... Beddington ...	80 Norwood ..... Croydon ..... Beddington ...
Mean amount of cloud at 9 A.M. ....	7.8 Norwood ..... Croydon ..... Beddington ...	7.6 Norwood ..... Croydon ..... Beddington ...	6.7 Norwood ..... Croydon ..... Beddington ...	7.3 Norwood ..... Croydon ..... Beddington ...	6.9 Norwood ..... Croydon ..... Beddington ...	7.1 Norwood ..... Croydon ..... Beddington ...	7.1 Norwood ..... Croydon ..... Beddington ...	6.9 Norwood ..... Croydon ..... Beddington ...	7.4 Norwood ..... Croydon ..... Beddington ...	6.3 Norwood ..... Croydon ..... Beddington ...	7.4 Norwood ..... Croydon ..... Beddington ...	7.8 Norwood ..... Croydon ..... Beddington ...	6.9 Norwood ..... Croydon ..... Beddington ...
Mean rainfall .....	1.75 Norwood ..... Croydon ..... Beddington ...	1.68 Norwood ..... Croydon ..... Beddington ...	1.53 Norwood ..... Croydon ..... Beddington ...	1.69 Norwood ..... Croydon ..... Beddington ...	1.86 Norwood ..... Croydon ..... Beddington ...	1.89 Norwood ..... Croydon ..... Beddington ...	2.83 Norwood ..... Croydon ..... Beddington ...	1.88 Norwood ..... Croydon ..... Beddington ...	2.06 Norwood ..... Croydon ..... Beddington ...	2.42 Norwood ..... Croydon ..... Beddington ...	2.51 Norwood ..... Croydon ..... Beddington ...	1.73 Norwood ..... Croydon ..... Beddington ...	23.83 Norwood ..... Croydon ..... Beddington ...
Number of rainy days, (0.01 in. & upwards)	15 Norwood ..... Croydon ..... Beddington ...	14 Norwood ..... Croydon ..... Beddington ...	13 Norwood ..... Croydon ..... Beddington ...	14 Norwood ..... Croydon ..... Beddington ...	13 Norwood ..... Croydon ..... Beddington ...	11 Norwood ..... Croydon ..... Beddington ...	16 Norwood ..... Croydon ..... Beddington ...	13 Norwood ..... Croydon ..... Beddington ...	14 Norwood ..... Croydon ..... Beddington ...	16 Norwood ..... Croydon ..... Beddington ...	18 Norwood ..... Croydon ..... Beddington ...	16 Norwood ..... Croydon ..... Beddington ...	173 Norwood ..... Croydon ..... Beddington ...
	15 Norwood ..... Croydon ..... Beddington ...	13 Norwood ..... Croydon ..... Beddington ...	13 Norwood ..... Croydon ..... Beddington ...	13 Norwood ..... Croydon ..... Beddington ...	13 Norwood ..... Croydon ..... Beddington ...	10 Norwood ..... Croydon ..... Beddington ...	14 Norwood ..... Croydon ..... Beddington ...	13 Norwood ..... Croydon ..... Beddington ...	13 Norwood ..... Croydon ..... Beddington ...	16 Norwood ..... Croydon ..... Beddington ...	17 Norwood ..... Croydon ..... Beddington ...	15 Norwood ..... Croydon ..... Beddington ...	164 Norwood ..... Croydon ..... Beddington ...



not much less than that of the majority of British stations, Leathwaite presenting the highest  $7^{\circ}7$ . These localities cannot of course compete with the south coast, much less with such a record as that of Weymouth ( $5^{\circ}4$ ).

Fogs and mists are relatively prevalent over the clay district, and to a slight extent even in parts of the Bagshot sand area.

A clearer atmosphere may be enjoyed on the chalk hills, which are probably exempt from fogs, and over the greensand region, the hilly parts of which should present the same immunity.

**Humidity of Air.**—In spite of their relative proximity to the Thames, the stations of Norwood, Croydon, and Beddington show a very moderate amount of humidity, 80, 80, and 81 per cent. respectively (at 9 a.m.), smaller than that recorded at the great majority of the British stations. Llandudno gives the lowest record, 79 per cent.; Belper, Cheadle, and Macclesfield the highest, 86 per cent. Here again we have cause to regret the lack of any returns from the remaining presumably drier regions in Surrey. We are probably justified in surmising that least humidity would be recorded on the heights of the North Downs, and in descending ratio (1) at the elevated sites on the greensand; (2) at lower levels of the same formation; (3) in the Bagshot sand district, although this is not free from damp in all parts; and (4) on the wealden clay.

It should be borne in mind that local peculiarities, as evidenced by the liability to mists, are apt to be very marked in the several regions. Of this we have a striking illustration in the contrast between Weybridge and Byfleet on the Bagshot sands, localities not far apart, yet singularly different as regards dryness, and between some of the riverside localities and the higher ground on the London clay.

**Wind.**—The prevailing winds are here as elsewhere the south-westerly. The only returns available, those from Beddington, show a predominance of the west wind; the south wind is also frequent. Rather less frequent, and nearly balanced are the periods of the north and of the east wind respectively. Before gaining Surrey the Atlantic wind storms have lost much of their pressure and the north-easterly gales much of their edge. Against the first the chief protections are the South Downs, which shelter the Weald, and in second line the North Downs, which act as a screen for the Thames Valley.

On the other hand this valley is a channel for the east winds.

and but for its sinuous character it would lay the North Surrey districts open to uncomfortable ventilation from this quarter. The main direction of the valley also favours the westerly winds, and affords little protection from the north.

The higher regions on the chalk are freely swept by many winds.

The most valuable protection is that enjoyed by the favoured region of the greensand, the main slope of which is south-westerly; and here many situations are efficiently sheltered from the north.

**Rainfall.**—The rainfall in Surrey is on the whole moderate. We learn from Symons's tables<sup>1</sup> for 1891, an unusually wet year, that the rainfall exceeded 40 inches only at one of the Surrey stations. During the same period in Sussex we find not only higher maxima, but more of them. In Surrey a large proportion of the stations give a record between 30 and 35 inches; and a large number also a record between 25 and 30 inches.

Along the Thames valley the numbers do not range high, a very interesting and significant fact in connection with the relative dryness of the atmosphere belonging to the same region. Thus we read:—

Kew Observatory	...	...	...	...	26·85 inches.
Battersea Creek	...	...	...	...	26·21 "
Richmond	...	...	...	...	27·45 "
Chertsey	...	...	...	25·95 to 29·39	"
Weybridge	...	...	...	...	29 to 30 "

These figures are lower than most readings from higher levels both on the North Downs and on the greensand.

The rainfall at Guildford is below 31 inches, and at Farnham below 32; but Reigate gives readings from 30·08 to upwards of 36 inches, and Dorking 38·28; Caterham Asylum has 38·69 against 25·57 inches at Caterham Valley. In the Godalming district we find 30·45 to 35·31 inches, and in that of Haslemere 39·33 to 42·22 inches, which is the wettest record, no other Surrey station yielding 40 inches. The wooded character of this district and its position at the van of the hill-formation towards the south-west suggest an explanation for this exception to the generally moderate character of the Surrey rainfall.

<sup>1</sup> G. J. Symons, F.R.S., *British Rainfall*, 1891.



METEOROLOGICAL TABLES.  
SPECIALLY PREPARED FOR THE REPORT TO THE ROYAL MEDICAL AND CHIRURGICAL SOCIETY,  
MONTHLY MEANS FOR TEN YEARS (1880-89), OR AS MUCH OF THAT PERIOD AS COULD BE OBTAINED.  
SOUTH NORWOOD (1881-85).

Month.	Mean Pressure in Month (9 a.m. & 9 p.m.)	TEMPERATURE OF AIR IN MONTH.						Mean Relative Humidity (9 a.m.) %	Mean Temperature of Air in Month.	Mean Relative Humidity (9 a.m.) %	Mean Maximum in Sun.	Amount of Sunshine.	WIND (9 a.m. & 9 p.m.)					Mean Ozone.	Mean Cloud (9 a.m.)	RAIS.	
		Highest.*	Lowest.*	Range.	Mean of Highest.	Mean of Lowest.	Mean Daily Range.						Calm.	N.	E.	S.	W.			Days it fell.	Inches.
January ...	...	57.1	11.1	46.0	43.2	33.6	9.6	38.4	91	...	...	...	...	...	...	...	...	...	7.9	13	1.52
February ...	...	56.7	24.1	32.6	47.1	36.7	10.4	41.9	89	...	...	...	...	...	...	...	...	...	8.0	14	2.26
March .....	...	68.3	20.1	48.2	49.7	34.8	14.9	42.2	81	...	...	...	...	...	...	...	...	...	6.7	9	1.10
April .....	...	71.6	24.5	47.1	55.1	38.7	16.4	46.9	75	...	...	...	...	...	...	...	...	...	6.6	11	1.56
May .....	...	79.6	29.6	50.0	61.9	48.7	18.2	52.8	71	...	...	...	...	...	...	...	...	...	6.3	11	1.36
June .....	...	83.5	37.6	45.9	66.9	49.3	17.6	58.1	72	...	...	...	...	...	...	...	...	...	6.8	11	1.70
July .....	...	94.1	41.9	52.2	71.1	53.0	18.1	62.0	72	...	...	...	...	...	...	...	...	...	6.6	13	1.57
August .....	...	89.2	42.1	47.1	69.8	52.2	17.6	61.0	75	...	...	...	...	...	...	...	...	...	6.6	10	1.47
September ..	...	83.7	32.2	51.5	64.2	49.3	14.9	56.8	84	...	...	...	...	...	...	...	...	...	7.0	16	2.86
October .....	...	68.7	26.7	42.0	54.9	42.1	12.8	48.5	87	...	...	...	...	...	...	...	...	...	7.0	16	2.84
November ...	...	61.1	24.1	37.0	49.8	38.9	10.9	44.3	90	...	...	...	...	...	...	...	...	...	7.4	16	2.18
December ...	...	57.1	19.6	37.5	44.3	35.3	9.0	39.8	91	...	...	...	...	...	...	...	...	...	7.9	15	1.58

\* Highest and Lowest = Absolute Highest and Lowest in Period.

MEANS FOR TEN YEARS (1880-89), OR AS MUCH OF THAT PERIOD AS COULD BE OBTAINED—QUARTERLY AND YEARLY  
SOUTH NORWOOD (1881-85).

QUARTERS AND YEAR.	Mean Pressure of Atmosphere (9 A.M. & 9 P.M.).	TEMPERATURE OF AIR.						Mean Temperature of Air.	Mean Relative Humidity (9 A.M.).	Mean Maxima in Sun.	Amount of Sunshine.	WIND (9 A.M. & 9 P.M.).					Mean Ozone.	Mean Cloud (9 A.M.).	Days it fell.	RAIN.  Inches.
		Highest.*	Lowest.*	Range.	Mean of Highest.	Mean of Lowest.	Mean Daily Range.					Calm.	N.	E.	S.	W.				
Jan.—March.	...	68·3	11·1	57·2	46·7	35·0	11·7	40·8	87	...	...	...	...	...	...	...	7·5	36	4·88	
April—June ..	...	83·5	24·5	59·0	61·3	43·9	17·4	52·6	73	...	...	...	...	...	...	...	6·6	33	4·62	
July—Sept. ...	...	94·1	32·2	61·9	68·4	51·5	16·9	59·9	77	...	...	...	...	...	...	...	6·7	39	5·90	
Oct.—Dec. ...	...	68·7	19·6	49·1	49·7	38·8	10·9	44·2	89	...	...	...	...	...	...	...	7·4	47	6·60	
Whole Year...	...	94·1	11·1	83·0	56·5	42·3	14·2	49·4	82	...	...	...	...	...	...	...	7·1	155	22·00	

\* Highest and Lowest = Absolute Highest and Lowest in Period.



## THE CLIMATE OF SURREY

MONTHLY MEANS FOR TEN YEARS (1880-89), OR AS MUCH OF THAT PERIOD AS COULD BE OBTAINED.  
WEST NORWOOD.

Month.	Mean Pressure of Atmosphere in Month. (9 A.M. and 9 P.M.).	TEMPERATURE OF AIR IN MONTH.						Mean Relative Humidity (9 A.M.).	Mean Maxima in Sun.	Amount of Sunshine.	WIND (9 A.M. and 9 P.M.).					Mean Ozone.	RAIN.	
		Highest.*	Lowest.*	Range.	Mean of Highest.	Mean of Lowest.	Mean Daily Range.				Calm.	N.	E.	S.	W.		Days it fell.	Inches.
January ...	ins. 30·079	55·0	10·8	44·2	41·7	33·0	8·7	37·4	90	...	10	9	11	14	18	...	7·8	1·59
February ...	30·007	58·0	16·3	41·7	44·9	35·0	9·9	39·9	88	...	5	11	9	14	17	...	7·7	1·81
March .....	29·979	67·6	17·8	49·8	48·5	34·7	13·8	41·6	81	...	7	12	14	10	19	...	6·8	1·37
April .....	29·895	72·7	24·8	47·9	54·5	38·6	15·9	46·6	74	...	5	15	15	11	14	...	6·8	1·72
May .....	30·000	84·7	28·0	56·7	62·3	44·0	18·3	53·1	69	...	9	12	13	10	18	...	6·6	1·76
June .....	30·012	83·6	35·1	48·5	68·0	50·0	18·0	59·0	71	...	7	14	12	10	17	...	6·7	1·86
July .....	29·956	93·4	42·9	50·5	71·4	53·5	17·9	62·4	70	...	11	6	5	16	24	...	6·3	2·60
August .....	·977	89·7	40·2	49·5	70·4	52·7	17·7	61·6	73	...	13	9	6	12	22	...	6·5	1·70
September ..	·988	85·6	32·0	53·6	65·0	49·4	15·6	57·2	81	...	13	10	8	11	18	...	6·9	2·46
October .....	·980	76·9	25·6	51·3	55·1	41·9	13·2	48·5	86	...	15	12	9	8	18	...	6·7	17 3·04
November ..	·986	62·5	20·9	41·6	49·2	38·9	10·3	44·0	89	...	11	8	8	11	22	...	7·3	17 2·55
December ...	29·976	56·8	18·4	38·4	44·1	35·0	9·1	39·6	90	...	9	9	6	13	25	...	7·5	17 1·93

\* Highest and Lowest = Absolute Highest and Lowest in Period.

MEANS FOR TEN YEARS (1880-89), OR AS MUCH OF THAT PERIOD AS COULD BE OBTAINED—QUARTERLY AND YEARLY.  
WEST NORWOOD.

QUARTERS AND YEAR.	Mean Pressure of Atmosphere (9 a.m. and 9 p.m.)	TEMPERATURE OF AIR.						Mean Temperature of Air.	Mean Relative Humidity (9 a.m.)	Mean Maxima in Sun.	Amount of Sunshine.	WIND (9 a.m. and 9 p.m.).					Mean Ozone.	RAIN.	
		Highest.*	Lowest.*	Range.	Mean of Highest.	Mean of Lowest.	Mean Daily Range.					Calm.	N.	E.	S.	W.		Days it fell.	Inches.
Jan.—March..	30.022	67.6	10.8	56.8	45.0	34.2	10.8	39.6	% 86	...	...	22	32	34	38	54	7.4	41	4.77
April—June...	29.969	84.7	24.8	59.9	61.6	44.2	17.4	52.9	71	...	...	21	41	40	31	49	6.7	38	5.34
July—Sept. ...	29.974	93.4	32.0	61.4	68.9	51.9	17.0	60.4	75	...	...	37	25	19	39	64	6.6	44	6.76
Oct.—Dec. ...	29.947	76.9	18.4	58.5	49.5	38.6	10.9	44.0	88	...	...	35	29	23	32	65	7.2	51	7.52
Whole Year...	29.978	93.4	10.8	82.6	56.3	42.2	14.1	49.2	80	...	...	115	127	116	140	232	7.0	174	24.39

\* Highest and Lowest = Absolute Highest and Lowest in Period.



MONTHLY MEANS FOR TEN YEARS (1880-89), OR AS MUCH OF THAT PERIOD AS COULD BE OBTAINED.  
BEDDINGTON (1881-89).

MONTH.	Mean Pressure of Atmosphere in Month (9 A.M. and 9 P.M.).	TEMPERATURE OF AIR IN MONTH.						Mean Temperature of Air in Month.	Humidity (9 A.M.).	Mean Maxima in Sun.	Amount of Sunshine.	WIND (9 A.M. & 9 P.M.).					Mean Ozone.	Mean Cloud (9 A.M.).	RAIN.	
		Highest.*	Lowest.*	Range.	Mean of Highest.	Mean of Lowest.	Mean Daily Range.					Calm.	N.	E.	S.	W.			Days it fell.	Inches.
January ...	...	55.0	7.2	47.8	42.2	31.8	10.4	37.0	91	...	...	...	...	...	...	7.6	14	1.73	...	
February ...	...	57.8	8.5	49.3	44.1	33.8	10.3	38.9	87	...	...	...	...	...	...	7.6	12	1.76	...	
March .....	...	66.7	16.2	50.5	47.8	33.3	14.5	40.6	82	...	...	...	...	...	...	6.6	12	1.54	...	
April.....	...	71.4	22.0	49.4	54.2	37.3	16.9	45.8	76	...	...	...	...	...	...	6.9	13	1.62	...	
May .....	...	81.3	25.8	55.5	62.0	42.7	19.3	52.4	72	...	...	...	...	...	...	6.5	13	1.97	...	
June .....	...	84.3	31.9	52.4	68.0	48.3	19.7	58.2	71	...	...	...	...	...	...	6.4	9	1.52	...	
July .....	...	93.2	37.3	55.9	71.5	51.7	19.8	61.6	70	...	...	...	...	...	...	6.2	14	2.66	...	
August .....	...	91.7	35.6	56.1	70.3	50.5	19.8	60.4	74	...	...	...	...	...	...	6.4	18	1.68	...	
September..	...	84.6	28.1	56.5	64.2	47.7	16.5	55.9	82	...	...	...	...	...	...	7.0	14	2.19	...	
October.....	...	78.4	22.7	55.7	55.0	40.5	14.5	47.7	86	...	...	...	...	...	...	6.8	16	2.58	...	
November..	...	63.0	18.9	44.1	49.1	37.9	11.2	43.5	89	...	...	...	...	...	...	7.4	16	2.69	...	
December ...	...	57.6	15.5	42.1	43.5	33.3	10.2	38.4	91	...	...	...	...	...	...	7.1	16	1.84	...	

\* Highest and Lowest = Absolute Highest and Lowest in Period.

# METEOROLOGY OF BEDDINGTON

295

MEANS FOR TEN YEARS (1880-89), OR AS MUCH OF THAT PERIOD AS COULD BE OBTAINED—QUARTERLY AND YEARLY  
BEDDINGTON (1881-89).

QUARTERS AND YEAR.	Mean Pressure of Atmosphere (9 a.m. and 9 p.m.)	TEMPERATURE OF AIR.						Mean Temperature of Air.	Mean Relative Humidity (9 a.m.)	Mean Maxima in Sun.	Amount of Sunshine.	WIND (9 a.m. & 9 p.m.)					Mean Ozone.	Mean Cloud (9 a.m.)	RAIN.	
		Highest.*	Lowest.*	Range.	Mean of Highest.	Mean of Lowest.	Mean Daily Range.					Calm.	N.	E.	S.	W.			Days it fell.	Inches.
Jan. — March..	...	66.7	7.2	59.5	44.7	33.0	11.7	38.8	87	...	...	...	...	...	...	7.3	38	5.03		
April—June...	...	84.3	27.0	62.3	61.4	42.8	18.6	52.1	73	...	...	...	...	...	...	6.6	35	5.11		
July—Sept. ...	...	93.2	28.1	65.1	68.7	50.0	18.7	59.3	75	...	...	...	...	...	...	6.5	41	6.43		
Oct.—Dec. ...	...	78.4	15.5	62.9	49.2	37.2	12.0	43.2	89	...	...	...	...	...	...	7.1	48	7.11		
Whole Year...	...	93.2	7.2	86.0	56.0	40.8	15.2	48.4	81	...	...	...	...	...	...	6.9	162	23.68		

\* Highest and Lowest = Absolute Highest and Lowest in Period.



## MONTHLY MEANS FOR TEN YEARS (1880-1889), OR AS MUCH OF THAT PERIOD AS COULD BE OBTAINED.

CRANLEIGH.

Month.	Mean Pressure of Atmosphere in Month. (9 A.M. & 9 P.M.)	TEMPERATURE OF AIR IN MONTH.						Mean Relative Humidity (9 A.M.)	Mean Maximum in Sun.	Amount of Sunshine.	WIND (9 A.M. & 9 P.M.)					Mean Ozone.	Mean Cloud (9 A.M.)	RAIN.	
		Highest.	Lowest.	Range.	Mean of Highest.	Mean of Lowest.	Mean Daily Range.				Calm.	N.	E.	S.	W.			Days it fell.	Inches.
January ...	...	53.9	7.1	46.8	40.2	28.4	11.8	34.3	...	...	...	...	...	...	...	...	7.3	8	1.19
February ...	...	55.3	23.2	32.1	46.0	34.2	11.8	40.1	...	...	...	...	...	...	...	...	8.0	14	2.65
March .....	...	65.6	23.2	42.4	53.3	36.9	16.4	45.1	...	...	...	...	...	...	...	...	5.6	10	1.52
April .....	...	66.0	25.1	40.9	55.5	38.8	16.7	47.1	...	...	...	...	...	...	...	...	6.5	14	1.84
May .....	...	78.9	30.0	48.9	62.9	43.3	19.6	53.1	...	...	...	...	...	...	...	...	6.1	10	1.01
June .....	...	78.5	35.0	43.5	65.7	48.0	17.7	56.9	...	...	...	...	...	...	...	...	7.5	16	2.38
July .....	...	91.8	43.2	48.6	70.5	52.1	18.4	61.3	...	...	...	...	...	...	...	...	6.8	18	3.45
August .....	...	78.9	41.7	37.2	68.6	51.5	17.1	60.1	...	...	...	...	...	...	...	...	7.4	14	2.42
September ..	...	83.3	38.2	45.1	64.7	48.5	16.2	56.6	...	...	...	...	...	...	...	...	6.9	16	3.99
October ....	...	67.0	25.6	41.4	54.6	40.7	13.9	47.7	...	...	...	...	...	...	...	...	6.8	19	5.16
November ..	...	61.3	23.2	38.1	50.7	37.8	12.9	44.3	...	...	...	...	...	...	...	...	6.2	19	3.89
December ...	...	55.9	14.0	41.9	45.9	34.9	11.0	40.4	...	...	...	...	...	...	...	...	7.1	19	3.41

MEANS FOR TEN YEARS (1880-89), OR AS MUCH OF THAT PERIOD AS COULD BE OBTAINED—QUARTERLY AND YEARLY.

CRANLEIGH (1880-82).

QUARTERS AND YEAR.	Mean Pressure of Atmosphere (9 A.M. & 9 P.M.).	TEMPERATURE OF AIR.						Mean Temperature of Air.	Mean Relative Humidity (9 A.M.). %	Mean Maximum in Sun.	Amount of Sunshine.	WIND (9 A.M. & 9 P.M.).					Mean Ozone.	RAIN.	
		Highest.*	Lowest.*	Range.	Mean of Highest.	Mean of Lowest.	Mean Daily Range.					Calm.	N.	E.	S.	W.		Days it fell.	Inches.
Jan.—March .	...	65·6	7·1	58·5	46·5	33·2	13·3	39·8	87	...	...	...	...	...	...	7·0	32	5·36	
April—June ..	...	78·9	25·1	53·8	61·4	43·4	18·0	52·4	77	...	...	...	...	...	...	6·7	40	5·23	
July—Sept. ...	...	91·8	38·2	53·6	67·9	50·7	17·2	59·3	81	...	...	...	...	...	...	7·0	48	9·86	
Oct.—Dec. ...	...	67·0	14·0	53·0	50·4	37·8	12·6	44·1	91	...	...	...	...	...	...	6·7	57	12·46	
Whole Year...	...	91·8	7·1	84·7	56·6	41·3	15·3	48·9	84	...	...	...	...	...	...	6·9	177	32·91	

\* Highest and Lowest = Absolute Highest and Lowest in Period.



MONTHLY MEANS FOR TEN YEARS (1880-89), OR AS MUCH OF THAT PERIOD AS COULD BE OBTAINED.  
CROYDON (ADDISCOMBE).

Month.	Mean Pressure of Atmosphere in Month (9 a.m. and 9 p.m.)	TEMPERATURE OF AIR IN MONTH.						Mean Temperature of Air in Month.	Humidity (9 a.m.) Relative	Mean Maxima in Sun.	Amount of Sunshine.	WIND (6 a.m. and 9 p.m.)					Mean Ozone.	RAIN.	
		Highest.*	Lowest.*	Range.	Mean of Highest.	Mean of Lowest.	Mean Daily Range.					Calm.	N.	E.	S.	W.		Mean Cloud (9 a.m.)	Days it fell.
January ...	ins. ...	55·3	11·6	43·7	41·9	32·3	9·6	37·1	90	...	37	...	...	...	...	7·9	14	1·72	
February ...	... ..	57·0	16·1	40·9	44·7	34·7	10·0	39·7	88	...	53	...	...	...	...	8·1	14	2·05	
March .....	... ..	66·8	17·8	49·0	48·1	34·4	13·7	41·2	82	...	127	...	...	...	...	7·2	12	1·56	
April .....	... ..	72·7	25·6	47·1	54·0	38·4	15·6	46·2	75	...	139	...	...	...	...	7·3	14	1·78	
May .....	... ..	81·2	28·0	53·2	61·5	43·7	17·8	52·6	70	...	210	...	...	...	...	7·0	12	1·74	
June .....	... ..	83·3	35·1	48·2	67·0	49·5	17·5	58·2	71	...	159	...	...	...	...	6·9	11	1·78	
July .....	... ..	92·4	42·1	50·3	70·3	53·2	17·1	61·8	70	...	195	...	...	...	...	7·0	16	2·52	
August .....	... ..	88·8	39·1	49·7	69·7	52·3	17·4	61·0	73	...	173	...	...	...	...	7·1	12	1·67	
September ..	... ..	85·1	31·1	54·0	64·3	49·2	15·1	56·8	81	...	112	...	...	...	...	7·4	15	2·52	
October .....	... ..	78·0	25·6	52·4	54·8	41·5	13·3	48·2	86	...	78	...	...	...	...	7·2	17	3·19	
November ..	... ..	62·2	15·4	46·8	49·2	38·8	10·4	44·0	88	...	56	...	...	...	...	7·8	17	2·91	
December ...	... ..	57·3	13·3	44·0	44·4	34·7	9·7	39·5	90	...	21	...	...	...	...	7·8	17	2·12	

\* Highest and Lowest=Absolute Highest and Lowest in Period.

† The Sunshine Observations are for the years 1880-84 only.

# METEOROLOGY OF CROYDON

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MEANS FOR TEN YEARS (1880-89), OR AS MUCH OF THAT PERIOD AS COULD BE OBTAINED.—QUARTERLY AND YEARLY.

CROYDON (ADDISCOMBE.)

QUARTERS AND YEAR.	Mean Pressure of Atmosphere (9 a.m. and 9 p.m.).	TEMPERATURE OF AIR.						Mean Temperature of Air.	Humidity (9 a.m.) in Sun.	Amount of Sunshine.	WIND (9 a.m. and 9 p.m.).					Mean Ozone.	Mean Cloud (9 a.m.).	RAIN.	
		Highest.*	Lowest.*	Range.	Mean of Highest.	Mean of Lowest.	Mean Daily Range.				Calm.	N.	E.	S.	W.			Days it fell.	Inches.
Jan. — March..	...	66·8	11·6	55·2	44·9	33·8	11·1	39·3	% 87	hrs.* 217	...	...	...	...	...	7·7	40	5·33	
April — June...	...	83·3	25·6	57·7	60·8	43·9	16·9	52·3	72	508	...	...	...	...	...	7·1	37	5·30	
July — Sept. ...	...	92·4	31·1	61·3	68·1	51·6	16·5	59·9	75	480	...	...	...	...	...	7·2	43	6·71	
Oct. — Dec. ...	...	78·0	13·3	64·7	49·5	38·3	11·2	43·9	88	155	...	...	...	...	...	7·6	51	8·22	
Whole year ...	...	92·4	11·6	80·8	55·8	41·9	13·9	48·9	81	1360	...	...	...	...	...	7·4	171	25·56	

\* Highest and Lowest = Absolute Highest and Lowest in Period.

† The Sunshine Observations are for the years 1880—4 only



## GENERAL AND THERAPEUTICAL CLIMATOLOGY OF SURREY.

Owing to an inland position the Climatology of Surrey is less abruptly heterogeneous, in spite of its variety, than that of the two other south-eastern counties; its variations lie between less divergent types. It does not offer opportunities for health of such first-rate importance; on the other hand, its general temperateness renders almost any part of its surface safe and enjoyable for residence. For the purposes of an outdoor and active life, and for facilities offered within very moderate intervals for changes of air as well as of scene it is hardly surpassed.

It presents distinct regional climatic types:

The relaxing climates (although in respect of moisture of air and in respect of rainfall the term is not applicable without reservation) are represented by the Thames Valley and by the valleys of tributaries of the Thames within the London clay area.

The moderately bracing as well as moderately relaxing climates are included within the Bagshot sand region.

Very bracing climates have their representatives in the elevated chalk districts.

Mildly stimulating and dry climates are those of various stations on the greensand.

Lastly, fairly protected, healthy, but not specially eligible for delicate people, is the climate of the wealden clay.

Within these broad lines of division local peculiarities introduce every shade of difference. Surrey therefore presents a rich assortment of healthy climates, among which almost each individual temperament, naturally sound, might pick out his ideal for residence. The climatic requirements of convalescents from most affections are also abundantly supplied in Surrey.

The question regarding the treatment of disease is of a very different order. It is obvious that Surrey cannot in this respect compete with the protected sea stations and especially with the south coast. Nevertheless careful search will lead to the discovery of many a site which might be of signal therapeutical advantage in each of the five geological regions enumerated above.

For the more numerous and the more important classes of invalids needing protection, viz., the rheumatic, the dyspeptic, and the pulmonary, it must be owned that the choice is much con-

tracted; but simple anæmia and scrofula, especially occurring in dwellers within towns, would derive benefit from residence at some of the invigorating, but for many sufferers almost too bracing sites in the North Downs.

The great mass of patients with bronchial affections, the dyspeptic, and in general all sufferers from irritability with weakness, will find their best home south of the South Downs. The same is also true of the rheumatic and of the gouty, for it must be admitted that although many localities in Surrey have an unenviable reputation as regards rheumatism, none are famed for its cure. Even places apparently eligible in point of relative dryness of surface-soil and of air, such as the Wimbledon district, the Bagshot sands, and the greensand sand area, are not free from some local prevalence of rheumatism, and on the elevated chalk, in spite of dryness of soil, the conditions would hardly fulfil the special indications for either gouty or rheumatic persons.

Yet there are chosen localities, especially in the greensand region, sufficiently well drained of surface moisture, and of sufficiently dry air, to be recommended for the preventive treatment both of rheumatism and of some forms of asthma.

The health resort for phthisis, that crying need of the metropolis, has yet to be discovered, at least in Surrey. Neither for the early nor for the late stages of the disease is there any suitable climate either on the London, or on the wealden, or on the Bagshot sands. The elevated chalk districts would present excellent bracing air for certain stages and for certain patients, but exclusively in summer. Analogous advantages would be found, with much less keenness of air and with greater warmth, within the greensand district, with the additional benefit of the stimulating exhalations from the pine trees. But for later stages the warmer temperature of the south coast is an essential.

There is a class of chest-invalids with limited or healing lesions, and upward tendency of nutrition, for whom the avoidance of unfavourable influences and a healthful, slightly protected, or at any rate not too trying climate, affording opportunities for much open-air life, are the main requisite. There are for such cases suitable sites in the southern pine district of Surrey. Indeed, a sunny situation on the southern slope of a tall hill with well-drained sandy soil is the fulfilment of such ideal as is attainable at the



latitude, for warmth, dryness, purity and mildly stimulating quality of air. The unfulfilled requirement is the avoidance of the cold wet days of a British winter, and of the too rapid alternations of relaxing weather and of frosts. This evil cannot be altogether met, but much might be achieved by engineer and architect to palliate its effects for the benefit of invalids.

#### THE BAGSHOT SANDS DISTRICT.

**Definition of the District and Boundaries.**—The district of the Bagshot sands, also known as the pine country, geologically interesting and important from the point of view of medical climatology, occupies the north-west corner of Surrey, bordering on the London clay in the north-east and in the north, where a narrow strip of this formation separates it from the Thames. In the south it is separated by a broader belt of clay from the chalk district and the North Downs. Beyond the confines of Surrey it extends, in Berkshire, to Ascot and Wokingham, and to Winchfield and Aldershot in Hampshire.

In Surrey, Chertsey and Weybridge are situated close to the northern boundary; Cobham marks the extreme easterly point reached by it; Woking, Worplesdon and Ash occur at equal distances near its southern limit; Frimley, Bagshot, Windlesham, and a part of Windsor Great Park are near the Surrey border in the west; lastly, Chobham, Bisley, Pirbright, Woodham and Byfleet occupy more or less central positions.

The district is watered by the Bourne, the Wey, and the Mole. It is also traversed by the Basingstoke Canal. The valley of the Bourne has a direction almost east and west. The Wey and the Mole take their course from south to north.

**General Physical Characters.**—Included between the North Downs and the river Thames, the district may be said to form part of the Thames Valley; but its moderate average elevation, its geology, and its vegetation distinguish it (with few local exceptions) from the rest of that valley, and remove it into a climatological category quite distinct from the riparian type in the strict sense.

Although it is not protected from the north by any tall range, it contains in itself important elements of local protection, not only

owing to its slight undulations, but more particularly thanks to its numerous wooded areas. Multiple shelter is afforded by its fir plantations scattered in thin groups over a wide area; and between the latter are included a large proportion of breezy commons.

In spite of its relative dryness it cannot be regarded as bracing, even in its more elevated parts. Its chief health-resort, Weybridge, has rather the reputation of being soft and relaxing; but between Chobham and Woking there is a broad expanse of well-ventilated common land.

The undulating character of the surface is in harmony with a free supply of intersecting streams. Between the latter the ground in places rises to some height.

**Elevations.**—The more important hills extend from north to south close to the western border of Surrey, between Virginia Water and Ash. The north-east portion of this group is known as the Chobham Ridges, although it is closer to Bagshot, whence the sands undulate up to the ridges and to Chobham Common. From this height the view ranges eastwards and across the Thames Valley to the north.

Two ranges of hills of unimportant altitude, parallel to each other and at right angles to the Chobham Ridges, or rather to Staple Hill, run almost due east. On the first lie Barrow Hills and Fox Hills; on the second Ottershaw. Rising to a height of 200 feet above the sea level, this hill commands a view as far as Hindhead and the Hog's Back. Staple Hill, which is the highest point in the district, and yields similar views to those from the Chobham Ridges, lies between Chobham and Virginia Water.

In contrast with these hilly parts the Bagshot sand district presents, especially in the neighbourhood of the Thames, some very low-lying localities.

**Natural Drainage.**—Were we to judge only from a general survey, natural opportunities for drainage would appear to be amply provided; in reality they are sufficient for the agricultural requirements, but not in all places for sanitary purposes.

**Geology.**—The surface is, as announced by the nature of the vegetation, almost exclusively sandy. Of course there are, at intervals, patches of clay, but in general the soil is everywhere



light. The ridges are of sand ; and where the clay chances to crop up in small patches, this occurs on the sides of hills or in the valley.

Beneath the sand the subsoil is of blue clay at a depth of three to four feet ; deeper still lies a layer of ironstone-pan, and, below this, sandstone. The presence of the layer of ironstone-pan modifies the climate considerably, as will be seen presently, by retaining the subsoil moisture.

**Trees and Vegetation.**—There can be no question that the many clusters and the few large tracts of pine contribute greatly to the shelter of the various sites. The local influence of pine woods on climate has been so often described that it hardly calls for comment. Neither need we dwell on the well-known fact that the growth of pine trees is an indication of the presence of sand. Beyond the North Downs, which form the boundary of the Bagshot sand district, we find the same vegetation in the extensive tract of green sandstone reaching as far as Haslemere, Liphook, and Liss ; and as a result the entire region may be looked upon as among the healthiest in Great Britain.

There are very fine oaks, beeches, and Spanish chestnuts in many parts, notably at Weybridge, Ottershaw Park, and Bottey's Park. In most places the Scotch fir predominates by the side of fine species of larch and spruce. From Weybridge the pine district ranges to Virginia Water by Barrow Hills and Fox Hills, as well as southwards in the direction of Woking, &c. Down to the eighteenth century the old Windsor Forest extended to Weybridge and to Ottershaw.

The light soil being easily worked, good crops can be grown with plenty of manure, but the general fertility of the district is not considerable, the soil being sandy and poor and easily burnt up ; and, except in the low-lying district by the Thames, the grass is very poor.

**General Description of Climate and Meteorology.**—Notable varieties of climate exist within the district stretching between the Thames and the Chalk Hills ; and, in general terms, this can only be described as a healthy open region, not bracing, but not relaxing, and reputed dry.

Meteorological data are scanty, there being no meteorological station. Weather reports are kept by several gentlemen in differ-

ent parts of the district, and Mr. G. J. Symons of Campden Hill, publishes the rainfall.<sup>1</sup>

The temperature is fairly equable. The rainfall is comparatively small and infrequent, and the atmosphere relatively dry. The dryness which we are accustomed to find associated with a sandy soil is, over a great part of this region, distinctly modified. Not only are there low-lying places in which the evenings are damp, but even in the higher sites the influence of an impermeable layer of ironstone-pan at no great depth from the surface makes itself felt in various ways. (1) Although the district enjoys the reputation of being fogless, a damp fog is not unusual; moreover in some parts the Thames fogs make their appearance. For instance, at Chertsey, Weybridge, and Addlestone, and even at the higher elevation of Ottershaw, the light east winds render the London fogs at times perceptible. (2) Again, though the surface soil is sandy and dry, and the roads dry quickly after rain, in many parts the wet clay holds the water at a depth of three to four feet, and this is raised by the heat of the sun in the shape of vapour; to this is attributed the fact that the sheep are subject to foot-rot. To meet this evil, deep drainage has been resorted to of late by some of the farmers.

**Special Features of Limited Districts and Resorts.—**

Bagshot and Bagshot Common with the black peaty earth lie high among pine woods.

Virginia Water is a fine pine district too well known to need description. Frimley and Bisley, Pirbright and Worplesdon, are situated among sand hills which are continued into the Aldershot ridges. The village of Cobham also enjoys a moderate elevation on a sandy soil with nice houses and residences.

In contrast with these, other places are low-lying.

Thorpe, with Thorpe Place, is pretty but lies low.

Chobham, another pretty village on the banks of the Bourne, is not free from the reproach of dampness.

Addlestone lies nearly as low as Chertsey. It is traversed by the Wey, which is apt to overflow into the cellars during the winter; but with the exception of some outbreaks in the past is otherwise healthy.

Byfleet is lower still, its cellars almost permanently under

<sup>1</sup> Cf. Symons's *British Rainfall* for 1891, p. 160.



water, and the basements of its old houses green with moss. At one time a favourite resort on account of its picturesque features, it has been comparatively deserted in more recent times.

Chertsey, a country market town, lies on gravel for the greater part. Some portions of the town are below the level of the Thames. There is therefore no convenient drainage. Yet, probably on account of the gravel, it is healthy, and rheumatism is stated not to be prevalent.

**Drainage.**—A good deal of attention has of late been given to drainage, which has proved in many instances a most troublesome question. In some places the absence of any fall, and in the entire district the porous character of the soil, have been the main difficulties. Again, owing to recent legislation and to its strict enforcement by the Thames Commissioners, instead of a convenience the neighbourhood of the river has proved a complication, for, unless restrained, the drainage will find its way by ordinary gravitation into the Thames.

At Chertsey the method adopted has been that of cesspools emptied by carts into a depot, for use in farms after treatment by subsidence.

Weybridge, Bagshot and Windlesham likewise use cesspools emptied periodically, and for the two latter a new system of cesspools has recently been introduced. Previously sewage would run into ditches for a distance of some fourteen miles and thence into the Mole. Weybridge and Walton have a scheme under discussion for pumping and precipitating sewage on twenty-five acres of land near the river. Chertsey will sooner or later require some analogous method.

Mention may also be made of a recent private scheme for a deep drain under the Thames from Staines, Chertsey and Walton to the opposite bank.

**Water Supply.**—More or less throughout the district the water supply is a difficulty. Deep wells are sunk, but their output is variable, some being soft and others hard, and all containing more or less iron. Again, drainage has been a danger, owing to the porous soil; and some wells have been neither deep enough, nor sufficiently distant from sources of contamination. In some cases water is derived from a distance; for instance, from Kingston for Weybridge, Addlestone and Virginia

Water. Again, in some localities rain water is used after filtering.

**Therapeutic Effects of the Climate.**—The medical climatology of this interesting district remains to be written. The present report has not had the advantage of much professional co-operation. A fair estimate of the general therapeutical indications may be gathered from the sketch which has been given. The climate of the most representative resorts included in this region may be regarded as protective rather than curative.

Weybridge with Walton-on-Thames, hitherto the only recognised health resort, cannot be classed among the bracing sanatoria. Nevertheless it is probably entitled to the reputation it enjoys for the treatment of the milder chronic chest affections, and as a residence for the aged and for delicate children, and also for sufferers from nervous complaints.

It is not unlikely that, at a greater distance from the Thames and at a higher elevation, more bracing localities possessing equal protection and a more vivifying air may, in the future, establish for themselves a stronger claim for the treatment of disease. At any rate the district abounds in sites suitable for convalescents, and most eligible as safe residences for the healthy.

The local prevalence of phthisis will be an important study in the future. The district, as far as we are aware, has never claimed to be exempt from the disease, nor to afford to sufferers any special grounds for a belief in its efficacy. The working classes have some rheumatism but not much gout.

#### GODALMING AND HASLEMERE AND THEIR DISTRICTS.<sup>1</sup>

Godalming is flat, but the suburbs around, presenting a gently undulating rise, especially towards the Charter House, are well drained and reputed to be very healthy. The waterworks at Frith Hill supply the Charter House and adjacent houses, while a new supply is being constructed at Munstead to supply Busbridge and the other parts of the town. The town of Godalming is managed by a town council, whilst Haslemere is included in the rural sanitary authority of the Hambledon Union.

The district south-west of Godalming comprises the Hambledon Union.

<sup>1</sup> From data kindly supplied by Samuel Rideal, Esq., D.Sc., F.C.S.



Low fever was very prevalent in Haslemere before the drainage was altered. The South-Western guide books state that it is the healthiest village in England. In the villages in the district there is some difficulty in disposing of sewage matters, but the local authorities are inquiring into this question; the earth-closet system is working well. The water supply is gradually improving; two or three of the villages have already a public supply; and this is also being discussed for Witley and Milford. In 1891 the population was 18,504, and the acreage 60,351. The birth-rate was 28·91, and the death-rate 15·94, including 127 over sixty years of age and 83 under five years of age. The death-rate from zymotic disease was 1·45 per thousand. People in most of the villages suffer very much from rheumatism, but much of this may be owing in some measure to their open-air work.

From Godalming the ground gradually rises along the Portsmouth road until the summit of Hindhead is reached (900 feet). The view along this road is remarkable for its extreme beauty, on either side are vast stretches of purple heather, and the pine-trees grouped together on the slopes remind one of Switzerland. The soil throughout the district is sandy except towards the east near Chiddingfold, Bramley, and Alfold, which are on the wealden clay. On the sandy districts the roads dry very soon after the rain, and there is a very marked absence of fogs. At Elstead and Hindhead the rainfall is much less than at Aldershot and Farnham. The northern slope is said to be warmer than the valley, and the harvests are early.

Towards Farnham and Elstead the gardens are very poor, and it takes many years to make one, owing to the sandy nature of the soil and the great abundance of the heather.

The top of Hindhead near Shottermill, about two miles from Haslemere, is becoming quite an important place, and many beautiful houses are springing up; it is a favourite resort for bicyclists, as the roads are very well kept, and it is a convenient halting place between London and Portsmouth. There are not many large pieces of water in the district except towards Frencham, where there are several beautiful lakes, which are good for fishing and skating. The high ground is very cold in the winter time, as might be expected.

CROYDON.<sup>1</sup>

The Reporter is indebted to Mr. Edward Lovett, F.R. Met. Soc., of Croydon, for the following notes on Croydon and its climatology, &c.

1. Croydon lies south of London in the Kentish corner of Surrey.

2. It is slightly protected from north winds by the Norwood (= North wood) Hills. South Croydon (sloping southward) is fully exposed to south and south-west gales. Duppas Hill much exposed to west winds; and Addiscombe and Park Hill very open to east winds.

3. It is situated on junction of tertiary and cretaceous beds.

The "West Croydon" area, Woodside, and all the northern parts, are on the stiff London clay, and are therefore cold, damp, and, in winter, foggy, when other parts are clear. The South Croydon district is on the chalk, which crops out here, and this part is hot and dry in summer, but cold in wet winters. The Addiscombe and Park Hill districts are on the Oldhaven, Woolwich, &c., beds, and are warm districts.

Early flowers appear first at Shirley near Croydon (Oldhaven beds), next at Park Hill, then at Addiscombe, and after that on the cold clays of the rest of Croydon. Park Hill temperatures in winter run higher than the lower parts of even the very near district. Much of the damp (for I consider Croydon damp) is due to—what I venture to think—the absence of streams, rivers, or natural watercourses. Thirty years ago I can remember two or three streams near Addiscombe and Park Hill, and the place was certainly drier in those days; but in winter now it is far more misty and foggy than it formerly was.

As Croydon slopes away south and west it gets the fair impact of the wet winds which are prevalent.

Hundreds of fine old trees have been destroyed in and about Croydon; but then thousands of gardens and ornamental trees have been planted during the last twenty-five years.

As a rule half-hardy plants, such as eucalyptus, &c., will not pass the winter in the open, whereas, at Tunbridge Wells (warm soil) I believe they do. Addiscombe and Park Hill soon suffer

<sup>1</sup> For Meteorological Tables see pp. 298 and 299.



from drought in a hot summer, owing to the light and porous nature of the soil.

The railway cutting through Park Hill has had, and is having, a serious effect on that area. All original natural drainage has been deranged by the great "ditch," and subsidences have taken place in many parts.

In many parts of Croydon, such as Fairfield, the Oval, Woodside, &c., Quaternary gravels overlie the London clay in patches, and more often in pockets; these latter are, I consider, misleading to the intending settler, or builder, who, thinking he is on what is so often spoken of as "the gravel," really builds on a basin of London clay, through which nothing can soak away, which, I take it, is rather worse than being on the clay itself.

The clays of the Park Hill district are thin and interspersed with strata of sands, pebble beds, and a shelly (*ostrea*) bed.

NOTE.—I cannot help thinking that it has been a mistake to fill up or otherwise do away with the few ponds and little streams, or perhaps even only ditches, which formerly occurred in my own locality—*i.e.*, Addiscombe and Park Hill.

## THE CLIMATE OF SUSSEX

By WILLIAM EWART, M.D., F.R.C.P.

### GENERAL DESCRIPTION.

*Boundaries and Divisions.*—The northern boundary has been described in connection with Surrey as far as Bearden, in the neighbourhood of East Grinstead. Near this spot three counties meet. To the west, the boundary between Sussex and Hampshire follows a rather irregular course from Hindhead Common to Petersfield, and thence a zigzag line due south to Emsworth and Chichester Harbour, which lies between Thorney Island and Hayling Island. At the opposite end of Sussex the Medway between Ashhurst and Tunbridge Wells, the Teise in the neighbourhood of Lamberhurst, and the Rother in the neighbourhood of Newenden assist in forming the eastern boundary. The ridge of Goudhurst is just within Kent; that of Dane Hill and Hawkhurst just within Sussex. The southern boundary is the sea from Emsworth to a point between Rye and Dungeness, about one-third nearer the former.

The boundary between the eastern and the western division of Sussex follows nearly the high road from London to Brighton. But it will be more convenient to adopt the railway line from Three Bridges to Brighton as a boundary, and to subdivide the eastern division into two by the railway from Tunbridge Wells to Groombridge.

The western division may be subdivided into a first portion between the Brighton and the Shoreham lines; into a second between the Shoreham and the Chichester and Midhurst lines;



and into a third from the last-named line to the Hampshire border.

Lastly the district between the South Downs and the sea will be described in connection with the coast.

**General Features.**<sup>1</sup>—"Sussex lies between latitude 50·43 and 51·9 N., and longitude 0·49 E., and 0·58 W." The county has an area of 1,466 square miles or 938,240 acres; the Downs occupy 99,840 acres, and the Weald 425,000.

"The South Downs divide it into two meteorological districts of unequal extent, and very different in their climates. In the western part of the county these hills are about ten miles distant from the sea. They continue eastward for a distance of about forty-five miles, gradually approaching nearer to the sea, and at length terminating in the bold headland of Beachy Head."

The average height of the South Downs is 500 feet, though several of their summits reach 800 feet. Ditchling Beacon is 858 feet, Firle Beacon 820 feet, and Chanctonbury Ring 820 feet above the level of the sea.

"Another range of hills, known as the Forest Ridge, extends from Fairlight Down through Crowborough to Petworth. The principal summits are Crowborough Beacon, 804 feet, Brightling Hill, 646 feet, and Fairlight Down, 599 feet above the sea."

Of the two lines of watershed, the South Downs and the Forest Ridge, the latter gives rise to most of the rivers of Sussex and of the Weald, viz., the Rother, the Cuckmere, the Ouse, the Adur, the Arun, and the Lavant.

**The South Downs.**—Beginning at Eastbourne this important hill-range extends along the coast to the Hampshire border, which it crosses a little south of Petersfield. Its principal section is entirely contained within Sussex. In West Sussex the hills diverge more and more from the coast. They are entirely composed of chalk, and the intervening low ground is also mainly chalk.

The South Downs consist of ranges of very steep hills intersected by valleys, sometimes spreading out into broad levels; but these are not extensive as a rule. Cultivated to a considerable extent for corn and other crops, a very large part of the downs consists of

\* Many of the facts stated were obtained from a valuable paper "On the Meteorology of Sussex," by the late Fredk. Ernest Sawyer, F.M.S. (a reprint from the *Brighton Herald*, May 23rd, 1874), from which quotations have also been made.

short close grass which is only used for grazing sheep. In many places one may go for miles without passing any cultivated ground; and it is to these tracts of country that the term downs more strictly applies. The uncultivated land forms a belt running parallel with the coast and extending inland a variable distance, but as a rule for about six or eight miles. Affording splendid scope for riding and walking, it does not perhaps offer as much ground suitable for building as might be expected, though probably quite enough might be found on closer search. A great deal of it is too hilly; and well-sheltered spots are scarce, owing to the lack of vegetation. The valleys are not protected from draughts; and some of them are not readily accessible.

At Eastbourne there is an abrupt ascent to the well-known Beachy Head, 530 feet above the sea; and undulating downs follow the line of cliffs, gradually becoming lower from here to Seaford, an unpretentious place scarcely raised above the sea level, but with an excellent walk along the sea front, and on the neighbouring downs a good golf ground and fine air. Passing along the flat to Newhaven, and crossing the Ouse, the downs rise again on the opposite side and spurs of hills run down from here to the cliffs by Rottingdean and Ovingdean to East Brighton; but from the middle of Brighton the coast is flat to Worthing and beyond it, the downs striking a slightly northerly direction, and gradually increasing their distance from the coast. The main ridge of the South Down hills runs at a distance of five or six miles from the sea from Eastbourne to Lewes, thence on, behind Brighton, by Ditchling Beacon, Wolsonbury Beacon, Devil's Dyke, to the river Adur at Bramber. On the opposite side of the Adur the ridge continues by Chanctonbury to the Arun near Amberley, two or three miles above Arundel, and then on, by Bury and Bognor, to Goodwood. Several of the places mentioned, such as Ditchling Beacon and Chanctonbury Ring, are over 800 feet high.

**The Sussex Weald and the Forests Region.**—Much of this vale resembles the Kentish Weald. Some part of it, however, possesses characters well worth notice, and essentially differing from what we have dealt with hitherto. About midway between the Surrey and Sussex ranges, near the western Kentish boundary, we find a very respectable range of hills which runs in an easterly direction along the north of Sussex and the adjacent border of



Kent. The most important part of it, extending from Horsham to Hawkhurst and Goudhurst in Kent, comprises the St. Leonards Forest, and the Ashdown Forests, with Crowborough, East Grinstead, Tunbridge Wells, Ashhurst, &c., but is not precisely limited by their bounds. The locality thus roughly defined presents characters of its own which distinguish it from any previously described, and is not so bleak and exposed as much of the Surrey hills and of the Sussex downs, which both have some of the barren character of chalk soil. Here we have a hilly district chiefly of sandstone, possessing great variety of scenery, much of which is very beautiful. In the so-called forests there is much wild country not unlike parts of Exmoor or Dartmoor; large stretches of common and uncultivated land—some of it heather-covered moorland; hillsides clothed with brushwood and scattered stunted trees; and in the bottoms, stony streams, rough grass, and peaty bogs. Sometimes one may go for miles and scarcely see a cottage, while a slightly different route will lead by homesteads, cultivated fields and fine woods. In short it is a district presenting an immense variety of attractions.

**Geological Formation.**—The geological formation of Sussex is analogous to, and its mineral constituents the same as, those of Kent and Surrey; their arrangement alone is different. Thus the belt of chalk is found at the south, its rise producing the South Downs; London Clay and Woolwich beds occurring at the extreme south-east between Durrington and Portsmouth, instead of the north as in Kent. The Hastings Sands are lined, to the south, by a belt of Wealden Clay, and this in turn by narrower belts of Upper Greensand and gault and of Lower Greensand. The concentric oval figure thus formed is, as elsewhere stated, interrupted by the coast line between Eastbourne and Folkestone; the greater part of this interval being occupied by the Hastings Sand deposit.

Bagshot Sands occur at Selsey Bill as an isolated deposit. Firestone is found in West Sussex, and Steyning is built upon it. The Eocene formation occurs at Bracklesham and the London clay at Selsey and elsewhere.

The following is from Mr. W. Topley's work on the *Agricultural Geology of the Weald* (quoted by C. Leeson Prince).

"Wherever the Hastings beds crop up from under the Weald

Clay they do so with gently rising ground, not a steep slope. Their rise continues towards the centre of the country until the ground attains heights considerably over the average elevations of the Lower Greensand. These chief points are Crowborough Beacon, Brightling Down, Fairlight Down, all in Sussex; Goudhurst in Kent."

"The term 'Valley of the Weald' is applicable only to the Weald Clay." "The Weald Clay passes under the Lower Greensand which is always associated with rising ground and generally with a steep slope or escarpment. It passes under the gault, which forms a narrow zone of clay underlying the lighter sand of the Upper Greensand. . . . The chalk overlooks the inner country in a fine escarpment, passing completely round the district, broken only by narrow valleys through which the rivers escape. The crest of the chalk escarpment is in Kent and Surrey a tolerably uniform flat, varying in height from 500 to nearly 900 feet. In Sussex and Hampshire it is more varied in outline; the highest point is Butser Hill, south of Petersfield, 882 feet."

The Lower Greensand country is generally of much less elevation than the chalk; but in the western part of Surrey it attains the height of 967 feet at Leith Hill. The highest point in the central country is Crowborough Beacon, in Ashdown Forest.

### **The Several Districts, in Greater Detail.**

I. *East Sussex as far as the Railway Line to Eastbourne.*—This area is roughly triangular with its base to the sea. The geological formation is uniformly Hastings Sand; but this deposit does not form the coast line east of the mouth of the Rother, nor west of the mouth of the Ashbourne. Both these rivers pass into the sea through irregular patches of alluvial deposit, to be described elsewhere more in detail. This district is traversed by the railway line to Hastings.

The river Rother flowing eastward from Mayfield and Heathfield to the border at Bodiham separates a northern from a southern district.

The smaller northern district is traversed from east to west by the Wadhurst Ticehurst, and Hawkhurst range, from the northern



slopes of which tributaries of the Tun and of the Medway take their origin, whilst those of the Rother and the Ouse arise from the southern slope. Saxonbury Hill, south of the extensive Eridge Park, and Blackthorne Hill are isolated members of the same system of hills. The whole district is hilly and picturesque. Salehurst, Etchingham, Burwash, occur between the hills and the southern branch of the Rother, which separates Greenhill from Rosehill farther south.

The southern district contains a central hilly region continuous with the heights of Winchelsea and Fairlight. The Brede takes an easterly course towards the plain of Rye. The Asten flows from Battle to St. Leonards, and the Ashbourne and the Cuckmere irrigate with their numerous tributaries the region of Heathfield, Penshurst, Ashburnham, Hurstmonceux, and Pevensay Level.

II. *East Sussex between the Eastbourne and the Brighton Railway Lines.*—The northern and larger portion is analogous to the northern part of District I., and has a subsoil of Hastings Sand down to a slanting line drawn between Wiversfield and Hurstmonceux. Its chief feature is the intricate group of hills covering the area of Ashdown Forest, between East Grinstead, Rotherfield, and Maresfield, and giving origin to streams which radiate from it towards all points of the compass. These hills are practically a continuation of the Wadhurst range, from which they are separated by the southern tributary of the Medway. Crowborough Beacon (803 feet) rises at the eastern extremity of the group.

West of Ashdown Forest the surface is less hilly, and it is freely watered by the Ouse, branches from which also irrigate the picturesque region of Lindfield, Fletching, Maresfield, Uckfield, and Mayfield, that of Waldron and East Heath being supplied by the Cuckmere.

South of the Hastings Sands area the successive belts of Wealden Clay, of Upper and Lower Greensand, and of chalk, run parallel to the coast line. The belt of clay land, of an even width of about three miles, presents no points of interest. On the narrow strip of Upper Greensand and of Gault we find Keymer, Ditchling, Barcombe, Ringmer, Chalvington, and Abbots Wood; and on the slightly broader band of Lower Greensand, Clayton,

Westmeston, Plumpton, Selmeston, and Berwick; no secondary hill range occurs in this section of the Wealden Greensand.

The South Downs form the northern boundary of the chalk district.

III. *West Sussex, between the Railway Lines to Brighton and to Shoreham.*—This narrow subdivision contains the western extremity of the extensive Hastings Sands deposit which has been described as the nucleus of the Wealden area. Horsham forms the point of a triangular area wedged in the Wealden Clay; the latter extends along the northern boundary (Rudgwick, Rusper, Ifield) as well as to the south (Cowfold, Shermanbury, Bolney, Twineham); the Mole draining the northern, the Adur the southern clay district.

Between the clay and the South Downs the Upper Greensand and Gault and the Lower Greensand are mere strips, not presenting definite secondary hills.

To return to the triangular area of Hastings Sands we find its greater part occupied by the St. Leonard's Forest, with Plummer's Plain to the south, Tilgate Forest in the north-east, and Highbeach Warren (440 feet) to the east.

Slaugham, Cuckfield, and Hayward's Heath occur towards the south; Three Bridges and Crawley in the north. The Arun takes its origin in St. Leonard's Forest by numerous streams and small lakes.

IV. *West Sussex, between the Railway Line to Shoreham and that Running between Midhurst and Chichester.*—North of Midhurst the boundary of this section is given by the road from Midhurst to Haslemere. This district lies entirely to the west of the nucleus of Hastings Sands, and includes only peripheral portions of the Wealden system. The South Downs, no longer parallel to the coast, gradually retire towards the north-west. At the same time the belt of Lower Greensand acquires greater width in the south as well as in the north, reducing the clay area which occupies the whole northern part of the district (Plaistow, Loxwood, North Chapel, Kirdford, Wisborough Green, Itchingfield, Billingshurst, Shipley, West Grinstead) to a fine point between Fernhurst and Bexley Hill; and this point extends still farther west. Tributaries of the Arun drain the greater part of the clay area.



The limits of the Lower Greensand deposit are marked distinctly by the short range of Bexley Hill north of Midhurst. Petworth and Warminghurst are on the border, which presents between them the names Mareshill and Dane Hill.

Near Pulborough the Arun is joined by the Rother, whose course lies through Petersfield and Midhurst along the valley between the South Downs and the secondary hills. Tillington, Egdean, Battleworth, Stopham, Hardham, West Chiltington, and Storrington belong to the Lower Greensand area.

The Gault and Upper Greensand form a rather thinner belt comprising Cocking, Heyshot, Sutton, Bignor, Bury, Amberley, and Sullington at the foot of the South Downs.

The chalk area is extensive, and includes, between Durrington and the county border, a thin wedge of London Clay and Woolwich beds as an extension from the larger deposit in Hampshire. Chichester and Arundel are built on the Woolwich beds, which predominate here.

V. *West Sussex, between Hampshire and the Railway Line from Chichester to Midhurst.*—This narrow section comprises three geological zones: (1) Greensand in the north, (2) Chalk, and (3) London Clay, terminating in the south with an isolated deposit of Bagshot Sand (at Selsey Bill).

(1) The Lower Greensand acquires at this longitude its greatest width, and its secondary hills diverge at Rake (on the border) to receive the pointed termination of the Wealden Clay. The southern limb of this angular range is continued into the short Bexley Hill range. Rogate, Woolbeding, and Stedham belong to this area, Elsted, Harting Treyfore, and Bepton to the belt of Upper Greensand and Gault.

(2) The chalk area south of the Downs (Beacon Hill) presents at its centre the crescentic Bow Hill range and Stoke Down. Compton, North-, East-, and Up-Marden, and Funtington belong to this area.

(3) Woolwich beds form the transition between the chalk and the London Clay; and the latter surrounds Chichester Harbour, with the exception of a streak of chalk corresponding to Appledram, Bosham, and Chidham and to the northern half of Thorney Island. Bagshot Sands extend from Pagham Harbour and Earnley to the point of Selsey Bill.

## THE SUSSEX COAST.

*In continuation of the Kentish Coast (See pp. 399 to 403).*

*From Rye to Hastings.*—At the mouth of the Brede, a little to the east of Rye, the alluvium which forms the Romney Marsh comes to an end, and cliffs running from the inland height of Winchelsea reach the coast and are continued through Fairlight to the east end of Hastings, where they rapidly fall to the dead level of St. Leonards and of Bexhill.

*From Hastings to Eastbourne.*—The mouth of the Ashbourne is the eastern boundary of the alluvial plain of Pevensey, behind which Hurstmonceux marks the southern limit of the Hastings Sands, and Hailsham the reappearance of the Wealden Clay. This latter deposit sends a narrow tongue as far as the sea front, dividing the alluvial plain of Pevensey from the smaller one belonging to Eastbourne. The narrow band of Upper Greensand stops short at Polegate, but the Lower Greensand extends a little further south to meet the road from the Eastbourne railway station to Seaford. From this point down to the sea front, the chalky slopes from Beachy Head form the western boundary of the alluvium.

*From Eastbourne to Bognor.*—Thenceforth westward as far as the approach of Bognor runs a nearly uniform belt of chalk, averaging five miles from north to south; but its cliffs do not extend beyond East Brighton. Seaford and Newhaven each present a small deposit of the Woolwich formation.

The South Downs ranging from Beachy Head past Alfriston, Alceston, Glynde, Lewes (Hassock's Gate), Steyning, Amberley, Up-Waltham, and Marden, pass with north-westerly direction into Hampshire, tracing by their abrupt declivity towards the north the occurrence of denudation at their highest level.

Along the low-lying coast west of Brighton we notice Shoreham at the mouth of the Adur, and in the interval between Shoreham and Hove, Southwick, and Kingston by Sea. Worthing has South Lancing on its east side and Goring and Little Preston on its west side. Littlehampton is situated at the mouth of the Arun, from which Climping and Atherington are two miles distant



to the west. Middleton is the last name for mention along the chalk coast of Sussex.

*From Bognor to Thorney Island.*—The chalk is exchanged at Bognor for London Clay, which is interrupted at Pagham by the "Bagshot formation" of Selsey Bill, but reappears at East Wittering, and forms also the lower half of Thorney Island.

North of Selsey Bill, and immediately south of Chichester, the clay bed is narrowed down to an isthmus by the projecting chalk, but above this point it grows into a long narrow tongue running due west into Hampshire and also due east from Chichester as far as Durrington, north of Goring. It is cut by the Arun at Arundel, which partly rests on this deposit. Throughout this range a great deal of the Woolwich formation is intermixed with the clay. In Sussex the deposit in question is, as it were, included within the chalk range; but in Hampshire it becomes the southern boundary of the chalk.

**The South-Western Marine Plain.**—At the south-west corner of Sussex, between Hampshire and the Arun, the South Downs are from twelve to eight miles distant from the sea, and the greater part of the country is flat. The northern section of this district however presents secondary elevations, the most important being that which extends from Bignor Hill to Rook's Hill Beacon, close to West Dean and to Goodwood. This is a warm and sheltered district.

The southern section, or Chichester and Arundel district, is deeply indented by the harbour west of Chichester; due south of Chichester Selsey Bill projects into the sea, presenting Pagham Harbour, within four miles of Bognor, on its east side.

The whole of this expanse is flat and not possessed of a bracing climate; in some parts it is distinctly aguish.

Along the shore of Chichester Harbour, Old and New Fishbourne, Appledram, Birdham, Bosham, Chidham, West Itchenor, and Thorney in the island of Thorney, are all unimportant and without pretensions.

To the south, Wittering, Earnley and Bracklesham, and Selsey are also unattractive. The same may be said of Pagham, west of Bognor; and of Middleton, Climping and Atherington, between Bognor and Littlehampton.

For many centuries the Sussex coast has been encroached

upon; some of its estuaries and harbours silted up; and the course of some of the rivers modified, *e.g.* the Ouse and the Rother. Pagham Harbour was formed by a sudden irruption of the sea in the early part of the fourteenth century. Thousands of acres of Sussex land have thus been submerged. At very few places, as at Rye, the sea has retired.

### **General Climatology of Sussex.**

The climate of Sussex in general may be regarded as distinctly milder than that of Kent and of Surrey. This is due to differences, not so much in latitude as in situation, shelter and soil.

Sussex is more sheltered both from the north and from the east than either Kent or Surrey. A great proportion of its soil is either sand or chalk; but more potent than either of these influences is its vicinity to a warm sea. The climatic differences which this factor is capable of introducing between districts not far distant from each other, are nowhere more manifest than within Sussex itself. The South Downs establish as distinct a demarcation in the climate as they do in the landscape, by warding off the extremes of temperature to be found north of them, but chiefly by allowing undivided sway to the moderating influences from the sea. This favoured coast enjoys a warmer winter and a cooler summer than the neighbouring districts beyond the Downs.

Nevertheless even these more northerly regions are relatively protected by the Surrey Hills in the distance; and individual districts such as "the forests" possess the additional advantage of an undulating and wooded surface, which affords much local protection from wind.

Sussex north of the Downs is a delightfully picturesque and salubrious region for the healthy, and well adapted for the needs of convalescents, and of delicate constitutions requiring an open-air life without excessive stimulation. If a bracing climate be indicated it can be obtained at the higher levels on the Sussex hills.

The Weald, as late as the days of the Roman occupation was entirely wooded. Tilgate Forest, Ashdown Forest (with 18,000 acres) and St. Leonard's Forest (with 10,000 acres) alone remain, the wood having been cut down in connection with the iron industry which long prevailed in the Weald.

The rainfall which is still abundant, though it coincides with



dryness of air, must have been very great. Its excessive amount probably led to the formation of the Wealden lagoons, which are supposed to have occupied some of the valleys, and to the large marshes of Amberley, Lewes, Pevensey and Romney. The valley of the Adur was at one time under water up to Bramber.

On the southern slope of the South Downs are many excellent situations, hitherto but little utilised, with the best of natural drainage, that special to the chalk formation. Within a few miles from the sea, facing south, there is an unlimited selection of sites high, dry, bracing, and with many great natural advantages. The qualities which it is most difficult to find combined with those mentioned are adequate protection from winds and accessibility by rail and road.

The quadrant of hills stretching from Amberley in the west and approaching, at its south-eastern extremity, the sea at Lancing, defines a low-lying, well-sheltered, warm and fertile marine district between the Arun at Littlehampton and the Adur at Shoreham.

North Stoke, Burpham, Findon due south of Chanctonbury Ring, Sompting and Lancing are all more or less under the shelter of the hills. Nearer the sea the villages lie in close order (Leominster, Poling, Angmering, West-Tarring, Broad Water). Among the seaside places Rushington, East Preston, Ferring, Goring, and Lower Lancing may be mentioned, but none of them are important.

### Comparative Meteorology of the Marine and Inland Districts of Sussex.

(Chiefly from the late *F. E. Sawyer's Paper*.)

*Atmospheric Pressure.*—The pressure of the atmosphere does not appear to be an important element in comparing climates. The monthly means obtained at Uckfield by Mr. C. L. Prince will no doubt apply to the whole county:—

	Inches.		Inches.
January .....	29·954	July .....	30·007
February .....	30·035	August... ..	29·986
March .....	29·935	September .....	30·000
April .....	30·004	October .....	29·931
May .....	29·955	November .....	29·976
June .....	30·022	December.....	29·928
Mean of the year .....		29·982.	

*Solar Radiation*—Solar radiation is much greater on hills than in valleys. At Crowborough the highest recorded in the county was  $147^{\circ}2$  on August 21st, 1873. The highest at Brighton was  $134^{\circ}3$  on July 26th, 1872.

*Temperature of the Coast and Inland*.—A comparison of the temperature at the sea coast and inland cannot, owing to the paucity of inland observations, be carried out on a large scale. Mr. Leeson Prince's data on the climate of Uckfield are in this respect most valuable.

According to Sawyer,<sup>1</sup> "The daily range of temperature in the Weald is very great, and is, on the average, about half as much again as on the coast."

The following table shows the monthly mean of the daily range of temperature; the mean being calculated from observations of twenty-eight years for Uckfield, and of thirty-three years for Brighton.

	Uckfield.		Brighton.	
January .....	$10^{\circ}2$	.....	$6^{\circ}8$	(Minimum)
February .....	$12^{\circ}4$	.....	$8^{\circ}0$	
March .....	$16^{\circ}1$	.....	$9^{\circ}9$	
April .....	$20^{\circ}1$	.....	$13^{\circ}1$	
May .....	$21^{\circ}8$	.....	$14^{\circ}2$	(Maximum)
June .....	$22^{\circ}8$	(Maximum)	$13^{\circ}9$	} Relatively small.
July .....	$22^{\circ}6$	Relatively	$13^{\circ}3$	
August .....	$21^{\circ}8$	great.	$12^{\circ}3$	
September .....	$20^{\circ}2$	.....	$12^{\circ}5$	
October .....	$15^{\circ}8$	.....	$10^{\circ}5$	
November .....	$12^{\circ}6$	.....	$8^{\circ}4$	
December .....	$10^{\circ}1$	(Minimum)	$7^{\circ}4$	
Annual mean.....	$17^{\circ}2$	.....	$10^{\circ}9$	

The coast is much cooler than the Weald in summer, as well as warmer in winter. The autumn is also milder on the coast.

At Haywards Heath, a table of mean monthly temperatures for the period of five years, 1868—1872, shows a close approach to the temperatures registered at Eastbourne, though not reaching so high. The difference is less than one degree, except in October, November, December, and January, when it is slightly more.

<sup>1</sup> F. E. SAWYER, F.M.S., *The Meteorology of Sussex*, p. 4.



*The Temperature of the Sea and its Influence on the Temperature of the Air.*—It is needless to anticipate here the general remarks made in other parts of this Report (see Thanet), as to the warming influence of the Gulf Stream. Through the kindness of Dr. A. Newsholme, tables of the temperatures of the sea at Brighton have been obtained from the Pier-master. They are appended to the report on Brighton.

"Only twice during 110 years do we read of sea-water having frozen along the south coast, viz. in 1788 and in 1855; on both occasions a thin sheet of ice was observed at Brighton and elsewhere." (F. E. Sawyer, *loc. cit.*)

*Humidity*.—"The air on the coast of Sussex is more humid than in the Weald, and in the winter months approaches very nearly to saturation." At Brighton, the mean humidity for the year at 9 a.m. is 83. The following are some of the driest days during six years:—

1868.	June 19th .....	1 p.m. ....	47°.
	July 3rd .....	2.30 p.m. ....	44°.
	August 4th.....	2 p.m. ....	43°.
1870.	July 23rd .....	2 p.m. ....	31°.
1873.	August 19th .....	3 p.m. ....	40°.
1874.	June 8th.....	2 p.m. ....	38°.

*Rainfall.*—The average coast rainfall is 25 to 26 inches; that on the Weald nearly 33, or about 33 per cent. greater. To this is owing the fertility of the Weald.

The smallest rainfall is at Pevensy—at Bognor it is also very small.

Mr. F. E. Sawyer assigned three causes for the high rainfall of the Weald. (1) The attracting and condensing influence of the Downs on clouds; (2) The influence of the remains of the Wealden forests; (3) The course of the rivers forming paths, up which rain storms travel. Beachy Head, for instance, attracts rain clouds from Pevensy, where the fall is decreased, and directs them in two columns, into the Weald. The divided clouds, after missing Hailsham, unite again at Heathfield.

*Wind.*—"The south-east wind is the warmest in Sussex, probably owing to its blowing off the continent of Europe. In the summer, when the wind sets in, the temperature falls very slowly after sunset, and the nights are excessively hot. If rains begins

with a south-east wind it continues for a considerable time. The south-west wind is not so warm, and in fact in summer is quite cool, which is doubtless caused by the moisture it contains from blowing across the sea."

"The most prevalent winds in Sussex are the south-west and west. Mr. Prince says, 'The west wind is much more prevalent in this county than in the neighbourhood of London. I am inclined to believe that when the south-west current is not very strong, the western extremity of the Downs breaks its force, and sometimes alters its direction. On such occasions a south-west wind would continue to blow along the coast, and a westerly breeze across the Weald.'"

The land and sea breezes blow over the coast of Sussex from about the middle of April to the beginning of September, and are frequently accompanied by sea mists. The wind is not calm whilst the latter prevail, but is blowing frequently at the rate of 10-15 miles an hour. The sea breeze generally sets in about 10 a.m., and continues until sunset, and occasionally until midnight, when the land breeze begins and lasts until the morning again.

In conclusion, a smaller rainfall, greater humidity, a more equable temperature and a less daily range of temperature belong to the coast district south of the Downs, as compared with the inland district north of the Downs.

#### CROWBOROUGH AND THE ASHDOWN FOREST DISTRICT.

The statements and tables concerning Crowborough are derived from a valuable monograph by Mr. C. Leeson Prince.<sup>1</sup>

The highest point in the district of Crowborough is situated 796 feet above the mean level of the sea, and commands the most extensive panoramic view in the south of England. Tunbridge Wells, Mayfield, and Uckfield are each distant about seven miles from Crowborough.

The beds underlying it are the lowest of the Wealden series (Hastings beds).

The chief characteristic of the climate of this district is an

<sup>1</sup> *Observations upon the Topography and Climate of Crowborough Hill, Sussex, together with other Subjects of Collateral Interest.*



excessive rainfall. This is partly attributable to the height of the country and partly to its proximity to the southern coast.

Situated upon high ground the district is exposed occasionally to high winds, but these are, for the most part, less in force than at points situated 150 to 200 feet lower. The strong south-west and north-east winds are frequently more disposed to sweep round the hill than to pass over its summit.

The temperature is remarkably equable and conforms probably to that of localities similar to this in latitude and altitude. It is a general but very erroneous idea to suppose that in severe weather the hill tops are colder than the valleys. Although the temperature of the air on elevated ground is frequently colder at *mid-day* than that of the valley, yet on cloudless nights, when radiation of the heat absorbed during the day by the gravelly and sandy loam is at its maximum in the valley, the temperature on the hill will be from ten to twelve degrees higher. One of the most striking features of the temperature on high ground is the small daily range. In point of equability Crowborough will compare very favourably with the most popular health resorts in the kingdom.

HIGHEST AND LOWEST TEMPERATURES RECORDED IN CROWBOROUGH FROM  
1874 TO 1884.

	1874	1875	1876	1877	1878	1879	1880	1881	1882	1883	1884	Absolute
I. Highest Temp. in the Open Air	89·4	83·0	92·4	84·7	90·5	82·8	84·0	97·4	83·4	84·2	95·2	97·4
II. Highest Temp. in the Shade	86·8	77·6	87·5	79·0	82·3	77·0	80·0	91·5	77·8	79·1	88·9	91·5
III. Lowest Temp. in the Open Air	16·2	19·0	14·7	21·6	18·5	15·4	17·2	8·0	21·0	19·0	24·4	8·0
IV. Lowest Temp. in the Shade	17·6	20·4	16·8	23·3	19·3	17·6	19·6	9·0	24·4	21·1	25·8	9·0

*Crowborough Water Supply.*—In unusual droughts some of the artificial wells become exhausted, but the two chief public springs are never known to fail, and the water supply is abundant and of good quality. The average depth of the wells is from twenty to thirty feet. There are also some strong chalybeate springs oozing from various slopes on the waste land.

*Vegetation.*—The botany of the district differs little from that

of Tunbridge Wells. A list of somewhat rare plants found in the neighbourhood of Crowborough is given by Leeson Prince (*loc. cit.* p. 7).

*Climatic Indications.*—The climate appears to be more especially applicable to diseases of the respiratory organs, as well as to those arising from nervous depression, general languor and debility, whether from dyspepsia, hysteria, residence in foreign climates, or remittent and typhoid fever. The delightful and extensive scenery, the open, airy, and vivifying atmosphere, “abounding in ozone”—all contribute their share.

### UCKFIELD.

We owe to Mr. C. Leeson Prince<sup>1</sup> an exhaustive study of the climate of Uckfield, which may be taken as a sample of the climate of Central Sussex, north of the South Downs.

“The parish of Uckfield lies upon an undulating tract of country, situated about midway between the South Downs and the highest point of Ashdown Forest. The surrounding neighbourhood is well wooded, and intersected here and there by a few rivulets. The principal part of the town stands upon a gentle slope in a direction from north-east to south-west. The upper portion is 200 feet and the lower, at the railway station, sixty-six feet above the level of the sea. With the exception of some patches of clay on the southern side of the stream, the greater portion of the parish lies upon the stratum known as the Horsted beds of the Hastings sand, which extends from the Horsted to the borders of the contiguous counties of Kent and Surrey.”

*Temperature.*—The following are the mean temperatures for each of the seasons, for the period 1843 to 1870 (both years included).

The mean temperature of Winter	... ..	38°·96
“ “ Spring	... ..	47°·66
“ “ Summer	... ..	61°·34
“ “ Autumn	... ..	50°·45
The mean difference between Winter and Summer	... ..	22°·38
“ “ Spring and Autumn	... ..	2°·79

<sup>1</sup> *Observations on the Climate of Uckfield, Sussex, and its Neighbourhood, from 1843 to 1870.* By C. LEESON PRINCE, Member of the Royal College of Surgeons, Fellow of the Royal Astronomical and Geological Societies, Member of the Scottish Meteorological Society, &c. Second Edition. Lewes: H. Wolff. 1886.



*Rainfall.*—The mean of the monthly and yearly rainfall at Uckfield, Sussex, (in inches) was for the period 1843–1885—(forty-two years):—

January.....	2·867	August .....	2·502
February .....	2·014	September ...	2·870
March .....	1·810	October .....	4·057
April .....	1·817	November ...	3·071
May .....	2·027	December .....	2·604
June .....	2·121	Total .....	30·05
July .....	2·297		

In the wettest year, 1852, 50·55 inches fell; but in 1847 only 17·58, showing an extreme difference of nearly 33 inches.

The average for winter has been 7·46 inches; spring, 5·65; summer, 6·91; autumn, 10·0.

The number of wet days for the same period was as follows:—

January .....	14·7	August .....	12·4
February .....	12·7	September .....	12·0
March .....	11·8	October .....	15·5
April .....	11·5	November .....	13·8
May .....	11·4	December .....	13·8
June .....	10·7	Total .....	152
July .....	11·7		

*Humidity.*—During eight consecutive years, ending with 1857, the average mean temperature of the dew point for each month was:—

January .....	34°·9	August .....	56°·9
February .....	32°·9	September.. ...	52°·1
March .....	34°·0	October .....	47°·2
April .....	40°·6	November .....	38°·2
May .....	45°·4	December .....	35°·6
June .....	53°·1	Annual Mean..	44°·0
July .....	57°·1		

The annual mean was 5°·8 below that of the air.

*Barometric Pressure.*—Mean monthly readings of the barometer at 9 a.m. for seventeen years (1854–1870):—

January .....	29·954	July .....	30·007
February .....	30·035	August .....	29·986
March .....	29·935	September ...	30·000
April .....	30·004	October .....	29·931
May .....	29·955	November ...	29·976
June .....	30·022	December ...	29·928

The annual mean height of the barometer during these seventeen years (1854 to 1870) was 29·982, not much under 30·000; it was highest in the year 1858, and lowest in 1860, the former a

dry, the latter a wet season. The barometer stands very high in February. It is lowest in October and December, the former being by far the wettest month in this country.

### WINCHELSEA AND RYE.

(Notes kindly contributed by Dr. F. Bagshawe, F.R.C.P., of St. Leonards.)

"At the eastern end of the Sussex coast line lie the old Cinque Ports of Winchelsea and Rye, both now separated from the receding sea by flat lands of from one to two miles extent.

"Winchelsea (population 700) is about nine miles distant from Hastings; the intervening hills attain at Fairlight an altitude of about 600 feet. The present town with its three old gateways occupies a plateau with a steep escarpment half surrounding it some 100 feet high, evidently washed at its base by the sea in olden times. The fine old church, now half in ruins, occupies a central position, and testifies to the former importance of the place. The little town was carefully laid out about 1300 A.D. in rectangular blocks, and contains many good houses frequented in the summer by lodgers from a distance, who find it a quiet and picturesque retreat.

"On the way to Rye, two miles distant, is the old fortress castle of Camber. Rye is a Cinque Port, now removed from the sea by some three miles of low land, the modern harbour being thus removed to a distance. It is a market town of some importance (population 4,300).

"The church is very large and has many interesting architectural features of various styles. One old gateway remains. The Ypres tower was doubtless erected, in the twelfth century, for military purposes. There is little to attract visitors to take up even a temporary residence in the town. Across the river lies the extensive tract known as the Romney Marsh."

### HASTINGS AND ST. LEONARDS.

REPORT ON THE GENERAL AND MEDICAL CLIMATOLOGY BY A COMMITTEE OF  
THE EAST SUSSEX MEDICO-CHIRURGICAL SOCIETY.

The towns of Hastings and St. Leonards are situated sixty-two miles to the south-south-east of London, on a bend of the Sussex coast between the bays of Rye and Pevensey.



The country in the neighbourhood is undulating and picturesque presenting many beautiful walks and drives, the interest of which is increased by the presence of historic ruins and of quaint towns and villages. The hills, broken by numerous valleys, rise to a considerable elevation, attaining their greatest height at Fairlight, two miles from Hastings, where they measure 599 feet above the sea level. The two lines of hills behind the town afford an efficient protection from northerly winds.

The front of the town has a southerly aspect with a slight general inclination to the east, more marked at Hastings, St. Leonards looking nearly due south. It faces a fine expanse of open sea, which extends westward as far as the distant cliffs of Beachy Head, while on the eastern side the view is limited by the cliffs of the East Hill, which form an escarpment rising perpendicularly from the sea.

A fine esplanade three miles long has been constructed along the shore. It is lined by private residences, hotels, lodging-houses, and shops, and overhung by cliffs which shelter it from winds blowing from north-west, north, and north-east. On one of these cliffs are picturesquely situated the ruins of an ancient castle. The "Old Town" of Hastings, consisting of two main streets, is placed in a sheltered valley leading down to the sea. The present towns have spread over the neighbouring hills and valleys, but large areas of ground have been purchased by the Corporation and have been reserved as open spaces or converted into public parks and gardens. The "St. Andrew's Park" extends for nearly a mile along a sheltered valley at the back of the town.

The varying elevation of the ground and its relation to surrounding parts afford a considerable choice of climate. The slope of the ground and the character of the soil are in most parts favourable to the rapid escape of water after rain.

*Geological Formation.*—The beds are known as the "Hastings Sands." They consist chiefly of sandstones, sand, and ferruginous clays, and belong to the lower division of the Wealden Strata. The group comprises in descending order the following members :—Tunbridge Wells sand ; Wadhurst clay ; Ashdown sand.

#### **General Climatology.**

**Meteorology** (From observations taken for the Government Meteorological Office, London, by Henry Colborne, M.R.C.S.,

Borough Meteorologist).—The point of thermometric and other observations is 165 feet above the mean sea level, and about quarter of a mile inland. The mean height of the barometric column at mean sea level, and corrected to 32° F., is, at the hours of 9 a.m. and 9 p.m. combined, 29·961 in.

The mean shade temperature, deduced from maximum and minimum readings without any correction being made except for errors of thermometers, 49°·4.

Spring averages	...	...	...	...	45°·9.
Summer „	...	...	...	...	59°·9.
Autumn „	...	...	...	...	51°·5.
Winter „	...	...	...	...	39°·9.

The mean daily range is 10°·4. The day temperature averaging 54°·6, and the night temperature, 44°·2. The shade temperature ranges on an average through 60°, viz., from 20° to 80°. The highest point ever reached since accurate observations were commenced in 1875, being 86°·6, the lowest 16°·3.

The mean humidity of the air, at 9 a.m. and 9 p.m. combined, is 83°·8 (saturation = 100).

The most prevalent wind is from west-south-west, its mean force being 2·7 (on the scale 0—12) for the whole year.

The mean amount of cloud is 5·7, on the scale 0—10.

The average rainfall is 29·95 inches per annum, falling on an average of 183 days.

The mean amount of "bright sunshine" (during the past eight years) is 1699·9 hours as registered by Stokes' recorder. The highest total for one year was 1883·3 hours in 1887, and the lowest 1472·5 hours in 1888. There are on an average 73 days on which no bright sunshine is registered.

*Fog.*—Hastings and St. Leonards are particularly free from land fogs, and it is a frequent occurrence to find there a brilliant sunshine when fog prevails a few miles inland. This is specially the case during gentle winds from the northward in winter, when some of the finest weather is experienced. Sea fogs are not uncommon, chiefly in the spring season, but are temporary and fleeting.

*Characters of the Climate at Different Seasons.*—The presence of the large body of water warmed by the summer sun keeps up the temperature in the autumn to a much later date than



is the case inland, and gives a genial autumn season. The same influence also reduces the snow fall, and prevents it when fallen from remaining long.

There is often much wind in winter, chiefly from the south-west; after it has been blowing for a few hours it is of a warm and soft character.

The spring winds are north-east and east. From the former the town is much sheltered, while the east winds are often searching, but generally accompanied by bright sunshine. The summer is cool, to the surprise of strangers who expect the contrary. It is common to find the recorded temperature on the hottest days  $8^{\circ}$  or  $10^{\circ}$  cooler than those given for London. This reduction of temperature is at the expense of great evaporation, so that the air is heavily charged with moisture.

**Special Climatology**—For purposes of climatic description the towns of Hastings and St. Leonards may be regarded as consisting of (a) The sea front, (b) Valleys running inland, (c) High ground between the valleys and the back of the towns.

The sea front, facing the south, receives the greatest possible amount of direct sunlight and is sheltered by the high ground from northerly winds. This situation is, therefore, well suited for invalids requiring a mild winter climate. The Hastings end of the parade, looking a little towards the east, is less directly exposed to south-west winds, which are prevalent during the winter. The Marina, St. Leonards, which faces south, is rather less exposed to the east winds in the spring. A few terraces and squares, standing back from the line of houses on either side of them, are thus completely sheltered from both east and west winds.

The valleys and hillsides are sheltered from east and west winds but are more open to northerly blasts. Such situations are very agreeable in the spring and early summer months.

The summits of Maze Hill (St. Leonards), the East and West Hills (Hastings), and the high ground at the back of the town being exposed to winds are colder than "the front," and are fitting resorts for summer visitors who find the sea front too warm. Many cases of chronic phthisis do well on these breezy heights at all seasons of the year.

The whole of the sea line of the town is without trees, excepting low shrubs along the Marina. The short valleys

running inland are well timbered. Thus the Archery gardens, the public gardens behind the Victoria Hotel, the Gensing gardens, and the Alexandra Park afford well-grown groves of oak, elm, or poplar of considerable size.

*Vegetation: including a Record of some of the Winter-flowering Plants in Hastings and its immediate Neighbourhood, by John Underwood, M.D.*

"The very early, exceptionally severe, and protracted winter of 1890-91, has been very destructive to shrub and floral life in Hastings and its neighbourhood. Any record based on the observations of such a season would very inadequately represent the facts.

"Through most winters we have the Arbutus (*Arbutus unedo*), the Laurustinus (*Viburnum tinus*), and one of the yellow jasmines (*Gelsemium rudiiflorum*) flowering very freely. The Hydrangea (*Hydrangea hortensis*) blossoms far into the winter season. One of the Passion Flowers (*Passiflora palmata*?) flourishes splendidly over many of the houses, blossoming freely far into the winter season, showing at the same time a profusion of ripened gold-coloured fruit, the issue of the early summer blossoms.

"The scented violet, though rarely, if ever, growing wild in the immediate neighbourhood at the present time, flower plentifully in gardens all through the winter. The polyanthus in many shades of colour—(*Primula elatior*) garden varieties of that species—blossoms all through the winter.

"The primrose (*Primula vulgaris*), with its numerous cultivated varieties, blossoms freely both in gardens and wild. I have seen specimens in the month of January many times, growing wild in sheltered nooks of the woods in the immediate neighbourhood of Hastings, in full blossom. In many gardens a shrub-like species of veronica, in several shades of colour, blossoms far into the winter season. This plant has been "cut up" more severely during this inclement season than any other that I know of. The pink and blue hepatica, so well known in most gardens, flowers well through the winter.

"The yellow aconite blossoms freely in January. The snowdrop (*Galanthus nivalis*) comes into blossom here at least a month



earlier than in most localities. This remark also applies to the lesser celandine (*Ranunculus ficaria*). I have frequently seen the strawberry-leaved cinquefoil (*Potentilla fragrareastrum*) in flower a month earlier than its usual time. The scented variety of coltsfoot (*Pelaspites fragrans*) blossoms freely in January and February. This plant grows plentifully on the bank at the commencement of the "Uplands," St. Leonards. A very pretty pink-coloured erica flowers all through the winter in shrubberies and gardens in Hastings and neighbourhood. A white variety of this species flowers all through the winter in Gilbert's nursery gardens. The whitlow grass (*Draba verna*) comes into bloom a month earlier than elsewhere, and the same remark applies to the moschatel.

"This list represents the general winter flora. Others might be added. The butcher's broom (*Ruscus aculeatus*) is often in blossom at the beginning of February. In some localities this plant is not uncommon though generally very little noticed."

*The Local Prevalence of, or Immunity from Diseases.*

*Anæmia and Debility.*—Anæmia occurs frequently in hospital practice in Hastings, chiefly in servants and shop-girls whose occupations cause them to live under such conditions as usually induce this complaint. It is infrequent among the upper classes, though probably somewhat more prevalent among young ladies resident here than among those living inland. Many invalids, however, who come to the town on account of anæmia make rapid recovery under favourable conditions of exercise and surroundings. Gastric ulcer is not uncommon among young women.

*Scrofula and Tuberculous Diseases other than Phthisis Pulmonalis* are shown by hospital statistics and the experience of private practitioners to be uncommon. The climate, though not perhaps affording any special preventive influence in such cases, appears to be favourable to their recovery.

*Phthisis* (with special reference to hæmoptysis).—Among the townspeople phthisis prevails to no unusual extent. It must be borne in mind that a large number of hospital cases are phthisical persons who have come to live in the town in hope of

deriving benefit from the climate. The same may be said of many of our wealthier residents. In this way our death-rate from phthisis is considerably augmented.

Very many phthical visitors make satisfactory improvement under the influence of our climate. The long sunny parade, sheltered from northerly winds, offers facilities for outdoor exercise. Many persons have found that they can pass the winter at least as well here as in southern continental health resorts. This is especially the case when the patients can be induced to admit fresh air into their rooms freely both day and night. The "fresh air cure" is more practicable in a south of England seaside resort than inland, where the night air is damper and more chilly.

The prevalence of hæmoptysis varies much with the season of the year. It is at no time very common, but is more frequently observed during the prevalence of dry and irritating winds than during that of west and south-west winds. Severe attacks are rare excepting in persons of hæmorrhagic diathesis, or in patients with advanced cavities and small pulmonary aneurisms. Patients who have suffered from pulmonary hæmorrhage in drier climates have found themselves less liable to it in Hastings.

On the whole we have no reason to suppose that our climate induces hæmoptysis, and some of us are of the opinion that hæmoptysis is less common here than elsewhere.

*Chest Affections.*—The climate is decidedly conducive to recovery from acute attacks of bronchitis and catarrh. Patients suffering from chronic bronchitis find great relief from wintering here, and many elderly persons have settled here for this reason. Acute sthenic pneumonia is not a common ailment among residents. Dry pleurisy is not uncommon. Marked pleural effusion is unusual.

Very few cases of pure asthma occur among residents. Of visitors suffering from this complaint many do well here, others receive no benefit or are rendered worse. Patients coming from foggy districts generally benefit by the change. Residence on the high ground at a little distance from the sea is recommended for asthmatics.

*Renal Diseases.*—Acute renal dropsy is very rarely met with as an idiopathic affection. Chronic renal dropsy is not often seen except in persons advanced in years. Cases of these affections



occurring in visitors usually do well here. The mild and sunny climate is specially conducive to convalescence from acute renal disease.

Calculus is extremely rare (only *one* case in 4,000 consecutive hospital patients). Gravel is uncommon.

*Rheumatic Affections.*—We are of the opinion that acute rheumatism is somewhat less common here than in many other places, both among visitors and residents. Chronic rheumatism, on the other hand, is *not* less common here than elsewhere.

The number of cases of rheumatoid arthritis occurring among residents we take to be under the average. Many cases coming from damp places find the climate of Hastings and St. Leonards beneficial.

Myalgia and Neuralgia are not uncommon among all classes.

*Skin Diseases, particularly Eczema.*—The climate offers no particular advantages to persons suffering from these complaints, nor, on the other hand, does it appear to render them untractable to treatment. The degree of improvement to be expected in any given case depends largely upon the effect of the climate on the patient's powers of digestion and assimilation.

*Endemic Diseases.*—(Medical Officer of Health's Report, 1890.) The subjoined table will show the number of deaths from the seven principal Zymotic diseases during the year 1890 and the last ten years, with the annual Zymotic death-rate:—

	Smallpox.	Measles.	Scarlet Fever.	Diphtheria.	Whooping Cough.	Fever.	Diarrhoea.	Total.	Death-rate per 1000.
1880	0	34	5	1	8	4	32	84	2·16
1881	2	2	2	3	6	6	21	42	0·99
1882	1	24	5	4	34	2	20	90	2·03
1883	0	2	4	3	9	1	16	35	0·76
1884	2	15	0	5	28	3	31	84	1·81
1885	6	25	1	11	2	4	14	63	1·27
1886	1	16	1	3	11	3	40	75	1·45
1887	0	16	4	3	27	8	21	79	1·48
1888	0	0	3	4	5	2	11	25	0·47
1889	0	6	0	6	5	3	16	36	0·63
1890	0	18	2	6	14	4	7	51	0·94

Malarial affections are practically unknown.

Typhoid fever. The number of cases occurring in the Borough is very small. Many of the cases are undoubtedly *imported*. Average number of deaths per annum (for last eleven years) = 3·7 for the whole population (60,000).

Diarrhœa. Only seven deaths were registered from diarrhœa last year, five of which were those of infants, and occurred during the summer quarter.

Scarlet fever is not of common occurrence and has never prevailed epidemically. Most of the cases have been traceable to infection from convalescent visitors, and would appear to be of a mild type, as no deaths have occurred among the 171 cases treated at the Sanatorium during the last three years. Two deaths only were registered in the Borough from this disease last year.

There has been no outbreak of diphtheria in the Borough for the last six years. Sporadic cases have occurred, chiefly imported from London and district. There is no marked prevalence of endemic sore-throat.

*The Frequency of Old Age and Common Causes of Death among Permanent Residents.*—If those persons only who have been "born and bred" in the town are included among "permanent residents," it is impossible to give statistics of their death-rate. Deaths occurring among *visitors* staying here for a few weeks or months are classified separately in the death returns. But among the *residents*, not only are there included persons of tubercular tendency who, finding the climate beneficial to them, have made this place their home, but many persons who have come here suffering from other diseases (and hopeless of recovery) to end their lives under more genial climatic conditions.

During the last ten years there have been registered 5,896 deaths of *residents* as above defined.

Of these 16·66 per cent. were due to "Diseases of Respiratory Organs."

10·48	"	"	"Pulmonary Phthisis."
9·67	"	"	"Zymotic Diseases." (Chiefly measles, pertussis, and infantile diarrhœa.)
9·96	"	"	"Diseases of Nervous System " (Chiefly apoplexy and infantile convulsions and meningitis.)
9·05	"	"	"Diseases of Circulatory Organs."
6·49	"	"	"Old Age."



Of these 6·00 per cent. were due to "Diseases of Digestive System."  
(Including dentition.)

4·88	„	„	"Cancer and Malignant Diseases."
3·42	„	„	"Diseases of Urinary Organs."
1·58	„	„	"Scrofulous Diseases."

Old age. Of 743 deaths registered last year (including 133 visitors)

94	„	„	were of persons between 65 and 75 years old.
72	„	„	75 and 85
31	„	„	of 85 and upwards.

One frequently meets with persons of 90 and upwards.

*The Drainage.*—The new system of main drainage for the Borough of Hastings (which includes St. Leonards), was inaugurated by the Town Council in 1867.

The large main drain falls eastward and westward from the Archway (which formerly bounded the respective districts of the Hastings Sanitary Authority and the St. Leonards Commissioners), and extends along the whole length of the foreshore. At the east and west ends of this main artery—that is at "Rock-a-Nore" and "Bopeep"—are two large receiving tanks, into which sewage is continually flowing. From each of these tanks a large pipe discharges the sewage into the sea. That from the eastern tank runs eastward and southward to a point near Ecclesbourne Glen.

The sluice is opened at half-flood tide, when the water flowing up channel will carry the sewage eastward, away from the town. That from the western tank is opened at half-ebb tide, that is, when the current tends down channel. Between these two extreme points there is no outfall for sewage into the sea. In order, however, to dispose of the storm water which may run down the several valleys (such as that running inland from Warrior Square, and the much larger valley in which "The Park" and St. Andrew's parish lie), overflow tanks are made at the point of junction with the main drain. As the storm water rises in these tanks it flows over weirs and down culverts leading straight into the sea near low-water mark.

The smaller arteries of the system which bring down the drainage from the valleys and hillsides are receiving constant attention and improvement.

The ventilation of drains is carried out partly by means of gratings and partly by means of exhaust shafts on blank walls of

buildings. Air shafts have been constructed in various elevated positions, such as Maze Hill, Bohemia, Halton, &c., which are the highest points of the drainage system, and are situated some 200 or 300 feet above the sea level. Exhaust air shafts, provided with coke furnaces through which the air from the sewers will be drawn, will shortly be built at several points of the high ground.

*The Water Supply.*—The water supply of Hastings has formed a problem of some difficulty. The Wealden strata are here broken up into numerous faults some of which are most extensive. The supply is derived from wells, headings, and springs. Most of the wells are sunk in the Ashdown sand. The estimated daily yield from all sources was, in 1889, 1,285,800 gallons.

The water is pumped up to reservoirs placed at various altitudes. In order to avoid lifting the water higher than is necessary, and at the same time to prevent undue pressure on the service pipes, the plan has been adopted of dividing the district into four zones or services, each fed by its own reservoir and system of service pipes. Attached to each reservoir are filter beds built in pairs, so that they may be worked alternately. These are carefully constructed, having perforated stoneware pipes overlaid with layers of filtering media to a depth of three feet. The sides are cemented and the top arched over with brickwork.

Hastings is also supplied with a *constant service of salt water* for the purpose of watering the streets, baths, &c.

The water supply is, at present, quite sufficient for all requirements, and the water is of good quality. With a view to meeting the wants of a growing population, the question of increasing the water supply has been carefully considered by the engineer, Mr Palmer, and reported upon to the Town Council.

In his report, Mr. Palmer recommends that a supply should be sought in the lower greensand formation which occurs at Berwick, sixteen miles off, and again at Glynde, twenty-one miles away, underlying the chalk. From either of these sources a copious supply of water sufficient to afford a *constant service* could be obtained of excellent quality and moderate softness. It is expected that this recommendation will be carried out with little loss of time.

The whole of the water of the district is *soft*; even the hardest samples are soft when compared with chalk waters or with that



supplied to London. The hardest, before boiling, is about  $10^{\circ}8$  of Dr. Clarke's scale; the softest  $5^{\circ}$  (after boiling  $4^{\circ}2$  and  $3^{\circ}$  respectively).

The following three analyses were made by Mr. H. Cheshire, the Public Analyst. No. 1 was from water collected at Ecclesbourne pond; No. 2 from Filsham, No. 3 well; No. 3 from Filsham, No. 4 well. Mr. Cheshire reports, "All these are satisfactory, and Nos. 2 and 3 are nearly alike. No. 2 contains more iron and absorbs more oxygen, whilst No. 3 has more sediment other than iron on standing."

## No. 1.

Total solids	...	...	21 grains per gallon.
Chlorine	...	...	4.6 " "
Free ammonia	...	...	.04 parts per million.
Nitrates	...	...	present.
Sewage test	...	...	nil.
Solids char	very much	and burn	white.
Oxygen absorbing power,	slight.		
Sediment—Vegetable debris	with some stellate diatoms.		

## No. 2.

Total solids	...	...	25 grains per gallon
Chlorine	...	...	4.7 " "
Free ammonia	...	...	.06 parts per million.
Nitrates	...	...	slight.
Sewage test	...	...	nil.
Solids do not char.			
Oxygen absorbing power—	somewhat high.		
Sediment—Vegetable debris	and a good deal of iron.		

## No. 3.

Total solids	...	...	26 grains per gallon.
Chlorine	...	...	4.7 " "
Free ammonia	...	...	.06 parts per million.
Nitrates	...	...	slight.
Sewage test	...	...	nil.
Solids do not char.			
Oxygen absorbing power—	somewhat high.		
Sediment considerable, and contains	some iron with other		
mineral matter, and vegetable debris.			

\* From M. O. H. Report for 1888.

## Analysis of water from chief source of supply, October 1890 :

Total solids	...	...	15 grains per gallon.
Free ammonia	...	...	.01 per million.
Organic ammonia	...	...	.02.
Chlorine	...	...	5.1 grains per gallon.
Nitrates	...	...	almost absent.
Sol. solids, by heat	...	...	remain white.
Oxygen absorbing power—	low.		

\* Supplied by Town Clerk for this Report.

HASTINGS.  
I.

MONTHLY MEANS FOR TEN YEARS (1882-1888), OR AS MUCH OF THAT PERIOD AS COULD BE OBTAINED.

*From Tables specially drawn up for the Report to the Royal Medical and Chirurgical Society.*

Month.	Mean Pressure of Atmosphere in Month. (9 a.m. and 9 p.m.)	TEMPERATURE OF AIR IN MONTH.						Mean Temperature of Air in Month.	Mean Relative Humidity. (9 a.m.)	Mean Maximum in Sun. Sunshine.*	Wind. (9 a.m. and 9 p.m.)				Mean Ozone. (9 a.m.)	RAIS.	
		Highest.†	Lowest.†	Range.	Mean of Highest.	Mean of Lowest.	Mean Range.				Calm.	N.	E.	S.		W.	Days it fell.
January ...		53.7	21.4	32.3	44.0	35.6	8.4	39.8	89	57					7.0	18	2.69
February ...		53.9	19.7	34.2	44.8	36.4	8.4	40.6	89	76					7.0	15	2.01
March ...		63.6	21.7	41.9	46.8	35.6	11.2	41.2	83	127					6.0	16	2.02
April ...		70.0	27.6	42.4	53.8	40.2	13.6	47.0	78	163					6.0	15	1.95
May ...		74.0	32.6	41.4	59.7	45.6	14.1	52.6	77	220					5.9	13	1.79
June...		83.5	41.6	41.9	65.1	51.0	14.1	58.1	76	232					6.1	11	1.56
July ...		86.1	40.3	45.8	68.0	54.5	13.5	61.3	79	217					6.2	14	1.95
August ...		84.8	45.1	39.7	69.0	54.7	14.3	61.8	78	210					5.8	12	1.59
September .		79.0	33.8	45.2	65.1	52.2	12.9	58.6	85	151					5.8	16	3.09
October ...		74.0	30.1	43.9	57.2	44.9	12.3	51.1	87	119					6.0	18	3.85
November .		62.4	27.7	34.7	50.6	40.9	9.7	45.7	90	62					7.0	19	3.80
December...		55.7	24.2	31.5	45.6	36.3	9.3	41.0	90	57					6.7	20	2.96

\* The Sunshine Observations are made at St. Leonards, and are for the Years 1883-1889.

† Highest and Lowest = Absolute Highest and Lowest in Period.



## HASTINGS.

## II.

QUARTERLY AND YEARLY MEANS FOR TEN YEARS (1882—1888), OR AS MUCH OF THAT PERIOD AS COULD BE OBTAINED.

*From Tables specially drawn up for the Report of the Royal Medical and Chirurgical Society.*

QUARTERS AND YEAR.	Mean Pressure of Atmosphere. (9 a.m. and 9 p.m.)	TEMPERATURE OF AIR.						Mean Temperature of Air.	Mean Relative Humidity. (9 a.m.)	Mean Maxima in Sun. (9 a.m.)	Amount of Sunshine.	WIND. (9 a.m. and 9 p.m.)				Mean Ozone. (9 a.m.)	RAIN.	
		Highest.†	Lowest.†	Range.	Mean of Highest.	Mean of Lowest.	Mean Daily Range.					Calm.	N.	E.	S.		W.	Days it fell.
Jan.—March.	63·6	19·7	43·9	45·2	35·9	9·3	40·5	87	260*						6·7	49	6·72	
April—June.	83·5	27·6	55·9	59·5	45·6	13·9	52·6	77	615						6·0	39	5·30	
July—Sept.	86·1	33·8	52·3	67·4	53·8	13·6	60·6	81	578						5·9	42	6·63	
Oct.—Dec.	74·0	24·2	49·8	51·1	40·7	10·4	45·9	89	238						6·6	57	10·61	
Whole Year.	86·1	19·7	66·4	55·8	44·0	11·8	49·9	84	1691						6·3	187	29·26	

\* The Sunshine Observations are recorded at St. Leonards, and are for the Years 1883—1889.

† Highest and Lowest = Absolute Highest and Lowest in Period.

**Medical Climatology of Hastings and St. Leonards.**

The Committee's Report which has just been read is so comprehensive that it leaves room for little more than a brief summary of its conclusions. Indeed in the case of a resort so well-known and so largely used comments are almost superfluous.

Within the south-eastern district of England, Hastings and St. Leonards supply us with the type of the "protecting climates"; and they are the most important representatives of this climatic group. Although both towns present from place to place shades of difference in their meteorology, there is practically speaking but one climate, of which mildness is the pervading attribute. This uniformity is in itself an important feature. The term "relaxing" sometimes applied to it is to a certain extent a correct expression of the local peculiarities. The weather is rather atlantic in its oscillations than arctic; and when in spring the east wind chances to blow it tells rather keenly on feelings trained down by the prevailing milder influence. During the rest of the year, among the prevalent winds the south-west wind is uppermost in strength and in frequency, and it is probably to this atmospheric factor, in conjunction with protection from cold northern winds, that the "relaxing" quality is due.

It would be perhaps more accurate to regard this designation as relative, and applicable to Hastings and St. Leonards chiefly by way of contrast. Its more emphatic employment in particular instances is apt to reflect not so much on the climate as on the patient with whom this happens to disagree. We are familiar with every gradation of individual susceptibility, from an absolute intolerance of a seacoast life down to the need for the most enervating of seaside stations. To the latter class Hastings and St. Leonards do not belong. Indeed, but for the difference which they present with other resorts of a highly bracing kind, we might have heard of their possessing some stimulating virtue in addition to their mildness and equability. And this accords with their situation. Less distant from the Continent than most of the protected climates, they partake in some degree of continental features; while their northern shelter and freedom from fog allows the sun's rays a larger share in producing a special climate.

And it must be remembered that, when we emphasise the mildness and other advantages of Hastings and St. Leonards as a



winter resort, we refer especially to the sea front, and near proximity to the sea. The hilly situations have fewer winter advantages, whatever virtues they may possess as summer residences.

For the purpose which it is called upon to serve this climate is quite bracing enough. It is its softness which has brought it into repute; and of its therapeutic value in this direction there can be no question. Aspect and temperature, soil and sky combine to render Hastings and St. Leonards a chosen refuge for fragile lives unequal to the struggle against severe weather. They are a home of safety and of comfort for the chronic bronchitic, and for many a sufferer from other forms of mucous delicacy, or from irritable functions.

The contra-indications, beyond those which apply to marine stations in general, are singularly few. They might in most instances be more correctly expressed as indications for some more bracing influence rather than in the sense of absolute unsuitability. This wide range of usefulness shows that in Hastings and St. Leonards we possess resorts we could ill afford to spare and whose popularity rests on a safer basis than that of fashion.

#### BEXHILL-ON-SEA.

The small town of Bexhill-on-Sea, with a population of about 5,700, has attracted of late years more and more notice as a sea-side resort. Its convalescent institution is doing valuable work. Bexhill is a few miles distant from St. Leonards. Although it receives some shelter from the small hill at the back, it does not possess the same amount of protection as St. Leonards or Hastings.

**Geology.**—Three formations occur in the town:

1. A very beautiful hard white sand. (Ashdown Sand.)
2. A stiff red and blue clay. (Wealden.)
3. A soft rock. (Tunbridge Wells Sand.)

Roughly speaking, the first extends all along the coast and inland about half a mile to an elevation of fifty feet above the sea. Almost the whole of the new town is on this formation, but there is some clay on the lower and western side. The second lies in a belt about halfway up the hill, and is but little built on. The third and uppermost reaches an elevation of 150 feet, and is that on which the old village and a good part of the inland houses lie.

There is a chalybeate spring close to the town.  
The shore, which is shingle and sand, affords good sea-bathing.  
Swimming-baths are in course of construction.

*Local Prevalence of, or Immunity from Diseases.*

The joint report drawn up and forwarded by Dr. Ryan-Tenison shows local immunity from scrofula, very small liability to phthisis, hæmoptysis being rare; average prevalence of anæmia, bronchitis, and catarrh. Very little pneumonia or pleurisy. Eczema, neuralgia, and among the agricultural population chronic rheumatism, rather common; acute rheumatism and rheumatoid arthritis, rare; psoriasis, very rare.

Chronic albuminuria is rather common owing to the number of elderly residents. Acute renal dropsy not known; calculus and gravel almost unknown. The frequency of asthma is rather above the average.

Malaria is unknown. Typhoid rare.<sup>1</sup> Diphtheria occasionally seen, traceable to sanitary defects. Endemic sore throat and summer diarrhoea fairly frequent. Scarlet fever very rare.

Residence at Bexhill is very beneficial in anæmia, scrofula and tuberculous diseases, and in diseases of the respiratory organs, which may be sent there with advantage for the whole year. Chronic renal disease is also stated to do well.

*Dr. Wills' Special Report.*—"The general death rate, on an estimated population of 5,770, was, for 1890, 10·38 per 1,000, and the zymotic death rate 0·68 per 1,000.

COMMON CAUSES OF DEATH FROM RETURNS.

	1889.	1890.
Diseases of the respiratory organs, excluding phthisis ... ..	14	12
„ „ organs of circulation, including cerebral hæmorrhage .	10	11
„ „ nervous system ... ..	10	8
Phthisis ... ..	2	2
(Four cases were returned under this head in 1890: one a child under one year, one resident, and two visitors.)		
Frequency of old age: died at 60 and upwards... ..	21	23
died at 70 and upwards... ..	11	14
Of this last class the average age was ... ..	78	77

<sup>1</sup> Dr. Wills writes: "Typhoid fever is practically unknown. There was a localized epidemic eleven years ago, since which there has been none until last year, when some cases occurred in a labourer's cottage in which gross sanitary defects were found."



" Bexhill has always been very celebrated in this district for the longevity of its inhabitants, and the general salubrity of the climate was well described by one of my colleagues, who said that 'doctors could neither live nor die here.' "

*Drainage.*—The system of drainage is very perfect and consists of pipe drains. One part measures about six miles in all, and was constructed by the local board, and collects the sewage from the older and higher part of the town and outlying hamlets and delivers it into an intercepting sewer constructed by the De la Warr trustees. This part of the drainage has the majority of the manholes sealed, and large (birch) upcast ventilating shafts carried up at every dead end, and is kept frequently swept by means of flushing tanks, mostly automatic.

The large intercepting sewer above referred to receives all the drainage of the lower levels and empties it into a tank from which it is delivered at half tide, well away from the town and about 200 yards from the beach.

*Water.*—This is abundantly supplied by a private company and derived from two wells sunk deep in the Wealden formation. It is entirely free from organic impurity, but has hitherto been rendered unsightly by a large quantity of suspended iron. This is, however, now being got rid of by aeration of the water before passing it into the settling tanks.

#### EASTBOURNE.

The modern town of Eastbourne<sup>1</sup> is situated on the coast of Sussex, between latitude 50° 45' and 50° 46' N., and longitude

<sup>1</sup> For these notes on Eastbourne the reporter is indebted to a resident member of the profession.—Mr. R. Sheward in the introductory remarks to the *Meteorological Observations* for 1892, writes as follows:—

"Eastbourne is reputed to be on the site of an old Roman military station, and has been identified as 'Anderida.' Formerly the town was situated entirely on the east side of the spur of the South Downs, which ends in Beachy Head; now the town abuts immediately on the foreshore, and possesses a sea frontage of nearly three miles. Its aspect is E. and S.-E., so that the full benefit of winter sun is secured, yet when east winds are keen along the front, warm sunny shelter can always be found in the centre of the town. Beachy Head serves to break the force of the south-westerly and westerly winds, and also diverts much of the rain that would otherwise fall within

0° 16' and 0° 17' E., at the western extremity of Pevensey Bay, which is bounded on the east by the projection of coast-line at Hastings, and on the west by the bold promontory where the South Downs terminate in the cliffs of Beachy Head. Eastbourne, as known to most holiday-makers and invalids, consists of the parades and villas lying for the most part with their backs to the sloping Downs, and facing south-east across the bay. But the borough is of much larger extent than could be included in such a definition. It comprises four districts which within the memory of man were quite distinct aggregations of houses, but which now merge into each other without boundary lines or intervening spaces, viz., Old Eastbourne, the original village, which for many centuries has nestled in an inland hollow a mile and a half from the sea; New Eastbourne, or Southbourne, the region of the parades; Meads, once a little hamlet, now the west end of the borough, where villa residences are beginning to encroach upon the slopes of the Downs towards Beachy Head; and Sea Houses, the poorer part of the town, occupying the low-lying country to the north-east, on the way to Pevensey. To these divisions must be added the elevated district situated to the north and east of the hollow where the Old Town lies—a district known as Upperton, where building has been going on extensively for the last fifteen years. Between the westward extension of the town (Meads) and the inland extension (Old Eastbourne and Upperton) is a tract of country as yet, happily, unoccupied by buildings, comprising the south fields, the cricket ground, the golf links, and the grounds of Compton Place, a mansion belonging to the Duke of Devonshire.

In 1891 the population of the parish was 34,244, and the

the area of the borough. The greater part of the town being on the side of the chalk down, there is a good slope to run off the surface water, and dryness of the soil is promoted by the great porosity of the chalk.

“Two features are especially characteristic of the town, and add greatly to its attractiveness. The first is the preponderance of detached and semi-detached houses, and the second, the large number of trees planted in nearly every main road. This spreading-out of houses prevents an undue density of population, in other words, removes one of the most potent causes of unhealthiness in towns, and fully compensates for the necessarily higher rentals. The trees give shade and beauty to the streets, and greatly assist in purifying the soil, subsoil, and air. *Rus in Urbe* well describes Eastbourne, a large part of the borough being still farmed lands.



number of houses exceeded 5,300. The area, including the beach, is 5,840 acres, and the sea frontage is nearly three miles.

The elevation above sea-level varies greatly in different districts. The lowest ground is in the region between the railway and the eastern parades, and in a district known as the Wish, near the Devonshire Park. The districts of Meads and Upperton stand upon very high ground.

The town presents every variety of architecture; in Meads and Upperton red brick predominates; the houses in the best quarters are detached or semi-detached. The promenade in front of the Grand Parade, and its long extension towards Beachy Head, consist of several terraces with strips of turf, flower-beds, and plantations of tamarisk. The pier is a light iron structure, 1,000 feet long.

Besides the very flourishing golf-club, which annually attracts crowds of devotees to the Eastbourne links, the town presents all facilities to lovers of cricket, lawn-tennis, bicycling, and other amusements; the Devonshire Park provides a racquet court, skating rink, athletic sports, &c., and it would be hard to find better ground for riding than the South Downs. There is a very fine swimming bath in Carlisle Road, and (of course) the usual long row of bathing-boxes on the beach. Schools are extraordinarily numerous in Eastbourne. The Princess Alice Memorial Hospital contains thirty-eight beds. The Convalescent Home in connection with All Saints, Margaret Street, stands near the sea-front in the Meads district. The fashionable "season" is from the middle of July to the middle of September; but the place is enjoyable long before the crowd arrives and long after it has departed. October, November and December are often most delightful months in Eastbourne.

The advantages of Eastbourne as a health resort may be very briefly summed up as follows: much sunshine, pure air, and absence of fog; clean, quickly-drying roadways; a plentiful and good water-supply from wells sunk in the deep chalk, and—perhaps the greatest of its natural advantages—the proximity of the breezy, health-giving South Downs.

*The Climate and Geological Formation of the Eastbourne District.*  
*By Mr. G. F. Chambers, F.R.A.S.*

"The Poor Law Union of Eastbourne is a better area than the Borough when discussing climate, &c. The district is protected from south-west and west winds by the South Downs, which come to an end at Beachy Head. [The value of this protection will be best realised by making an excursion from Eastbourne, on a day when a south-west gale is blowing, to Seaford, which is open to the full force of the south-west gales.] It is exposed to north-east, east, and south-east. The effects of this exposure are much exaggerated in the popular mind. When an east wind is blowing anywhere in England it is no worse at Eastbourne than anywhere else; if anything, it is more endurable, because it comes to Eastbourne across a wide and flat expanse of country, and not in gusts through ravines or undulations in the surface of the ground.

"The upper parts of Eastbourne lie on chalk, and the lower parts on alluvial soil of a very porous character. This renders the atmosphere of the whole district very dry at all seasons of the year, even after prolonged rains.

"The higher and more fashionable residential parts of the town are well situated for drainage by gravitation, the elevation of such parts varying from 100 to 300 feet above the sea. But the older parts of the new town of Eastbourne are scarcely elevated at all above the sea level, and their efficient drainage has always been a difficulty.

"Fogs are rare other than the ordinary sea fogs of the English Channel. The porous character of the soil of the district is unfavourable to the development of local fogs, such as are common in the Thames valley and other river valleys in clay districts.

"The Eastbourne district is comparatively treeless, but for many years past it has been the practice of the local authority (now the Town Council) to plant the streets liberally with trees in the foreign boulevard fashion. These trees have now in most cases attained to a good size, and they contribute materially to neutralise the effects of dust and glare during the summer months. They also serve to retard the drying-up of the surface of the



roadways after watering by water-carts. The poorness and porosity of the soil of the Eastbourne district generally, hinders the development of vegetation as a rule.

"Ocean currents can only be said to affect the climate of Eastbourne as they affect the climate of all places lying on the sea coast, *i.e.* by equalising the temperatures of the adjacent land: lowering those temperatures in summer, raising them in winter.

"For detailed information on the meteorological circumstances of Eastbourne, see the 1891 edition of my *Handbook for Eastbourne*."

### *Meteorology.*

Abstract from the meteorological observations for the year 1892, by Mr. R. Sheward, F. R. Met. Soc., Meteorologist to the Corporation (published by authority):—

TABLE I.  
ATMOSPHERIC PRESSURE.  
(In inches and decimals of an inch.)  
*Averages for Five Years.*

MONTH.	ABSOLUTE READINGS.		Mean Monthly.	Mean Monthly Range.
	Highest.	Lowest.		
January .....	30·738	29·287	30·095	1·196
February .....	30·718	29·167	30·060	1·068
March .....	30·613	28·856	29·870	1·344
April .....	36·479	29·261	29·989	0·913
May .....	30·480	29·311	29·918	0·900
June .....	30·463	29·250	30·009	0·652
July .....	30·399	29·278	29·945	0·652
August .....	30·380	29·264	29·949	1·061
September .....	30·500	29·294	30·081	0·898
October .....	30·664	29·157	29·968	1·190
November .....	30·673	28·692	29·921	1·395
December .....	30·687	29·079	30·016	1·287

Annual Mean for the five years, 29·985 inches.

*Note.*—All readings are corrected for temperature, height above sea level, capillarity, &c.

TABLE II.  
CORRECTED FOR TEMPERATURE AND ALTITUDE.  
(In inches and thousands of an inch.)

MONTH.	ABSOLUTE READING.				OSCILLATION.		
	Highest.	Lowest.	Range.	Mean.	Most in 12 hours.	Mean per 12 hours.	Monthly Total.
January.....	30·523	29·407	1·116	29·892	0·420	·0875	5·425
February .....	30·493	29·169	1·324	29·802	0·450	·1060	5·160
March .....	30·537	29·309	1·228	30·013	0·561	·1012	6·275
April .....	30·479	29·421	1·058	30·111	0·323	·0786	5·719
May .....	30·334	29·653	0·681	30·022	0·197	·0704	4·365
June .....	30·442	29·477	0·945	30·030	0·373	·0876	5·256
July .....	30·319	29·588	0·731	30·026	0·395	·0767	4·755
August .....	30·264	29·549	0·715	29·956	0·269	·0919	5·698
September.....	30·460	29·566	0·894	30·020	0·246	·0947	5·679
October .....	30·284	29·330	0·954	29·743	0·326	·1036	6·423
November.....	30·518	29·698	0·820	30·068	0·249	·0750	4·524
December .....	30·418	29·509	0·909	30·004	0·590	·1133	7·022
Annual .....	30·537	29·169	1·368	29·974	0·590	·0911	6·662

The monthly average total oscillation was 5·552 inches. The highest reading (30·837 inches) for the year was observed at 9 A.M. on March 31st, the lowest (29·169 inches) at 9 a.m. on February 18th. The greatest movement of the mercury observed in twelve hours was a fall of 0·590 inch, recorded on the morning of December 9th.

TABLE III.  
TEMPERATURE. (*Averages for Five Years.*)

MONTH.	DECADES.			THE MONTH.	DAILY RANGE.
	First.	Second	Last.		
January.....	39·2	38·0	42·5	39·7	8·7
February ...	41·7	39·3	37·4	39·6	9·7
March .....	38·4	40·8	42·8	40·8	10·1
April .....	44·9	44·2	46·9	45·2	10·6
May .....	49·8	52·3	54·6	52·3	11·1
June .....	56·7	55·6	59·9	55·9	11·2
July .....	59·4	59·5	60·9	59·9	10·1
August .....	61·8	60·1	59·9	60·4	10·7
September...	57·4	56·9	55·5	56·3	10·5
October.....	52·8	50·4	49·2	50·6	11·1
November ..	48·0	48·0	46·0	46·8	9·2
December ...	44·1	40·5	39·0	40·9	8·7

Mean annual temperature 49°·0.

Mean daily range for year 10°·1.



*Note.*—These figures are based on the means of the records by the maximum and minimum self-registering thermometers. The readings are in degrees and decimals of a degree, Fahrenheit scale. In the last decade, the number of days varies from eight to eleven, according to the month.

TABLE IV.  
TEMPERATURE OF THE AIR  
(In degrees Fahrenheit).

MONTH.	ABSOLUTE.		MEANS OF			MEAN OF MAX. AND MIN.	MEANS OF READINGS.		DIFFERENCES FROM DAY TO DAY.	
	Highest.	Lowest.	Daily Max.	Daily Min.	Daily Range.		At 9 a.m.	At 9 p.m.	At 9 a.m.	At 9 p.m.
January ...	51·4	22·2	42·9	34·5	8·4	38·7	38·4	38·4	5·5	3·9
February ...	52·2	21·5	45·1	36·1	9·0	40·6	39·5	38·1	4·2	3·8
March .....	52·2	25·4	43·3	33·1	10·2	38·2	37·9	37·6	2·6	2·8
April .....	64·4	29·4	53·5	39·7	13·8	46·6	47·0	45·8	3·6	2·7
May .....	69·3	33·7	59·4	46·7	13·7	53·0	54·4	51·8	2·9	2·9
June .....	73·2	41·0	61·6	50·1	11·5	55·9	56·2	54·4	3·0	2·6
July .....	70·3	50·0	65·0	54·2	10·8	59·6	59·9	57·6	2·3	2·0
August .....	73·2	51·0	67·6	56·8	10·8	62·2	62·3	60·9	2·2	2·7
September...	67·6	43·0	63·2	52·5	10·7	57·8	58·6	57·8	3·3	3·0
October.....	58·2	35·0	54·0	43·3	10·7	48·7	48·5	47·4	2·8	3·2
November...	57·0	37·4	52·5	45·0	7·5	48·8	48·0	47·8	4·0	3·0
December ...	58·2	25·3	45·8	36·3	9·5	42·1	39·7	40·1	4·8	3·9
Annual .....	73·2	21·5	54·6	44·0	10·6	49·4	49·2	48·1	3·4	3·1

The highest temperature, 73·2°, was observed on June 10th and on August 18th; the lowest for the year, 21·5°, was observed on February 17th. March proved to be the coldest month, and August the warmest. The exceedingly small difference between the temperature at the hour of 9 a.m., and the mean of the highest during the day, and the lowest at night, or the true mean temperature, is worthy of note.

TABLE V.

## BRIGHT SUNSHINE.

*Five Years' Average, 1888 to 1892 inclusive.*

MONTH.	DECADE.			THE MONTH.
	First.	Second.	Third.	
January .....	21·2	19·4	24·0	64·6
February .....	21·6	29·8	27·6	79·0
March .....	25·0	34·5	45·4	104·9
April .....	56·6	44·8	58·5	159·9
May .....	63·8	74·3	94·9	233·0
June .....	68·7	68·3	66·8	203·8
July .....	64·1	57·3	72·7	194·1
August .....	62·9	50·7	66·8	180·4
September .....	57·9	73·9	43·7	175·5
October .....	44·6	46·1	35·7	126·4
November .....	21·9	15·5	13·7	51·1
December .....	19·7	21·6	21·4	62·7
Annual .....	...	...	...	1635·4

TABLE VI.

*Hours of Sunshine in 1892.*

MONTH.	1892.					BRIGHTEST AND Dullest MONTH IN FORMER YEARS.			
	Total Hours.	Above or below Average.	Most in one Day.	Date.	Sunless Days.	Brightest Month.	Year.	Dullest Month.	Year.
						Hours		Hours	
January ...	82·0	15·4 above	7·1	12th	10	82·0	1892	39·6	1889
February ...	66·8	12·2 below	8·1	18th	10	120·7	1891	45·9	1888
March .....	142·3	35·4 above	11·5	30th	2	143·3	1887	63·9	1888
April .....	235·1	75·2 above	13·0	23rd	1	235·1	1892	128·2	1889
May .....	236·0	3·0 above	14·1	30th	0	267·9	1890	167·0	1887
June .....	237·0	33·2 above	14·7	24th	0	253·2	1887	150·9	1888
July .....	237·2	43·1 above	13·8	22nd	1	304·1	1887	136·0	1888
August ...	192·7	12·3 above	13·2	12th	2	233·9	1887	152·0	1891
September .	141·9	33·6 below	11·4	15th	2	207·4	1890	137·2	1885
October ...	114·8	11·6 below	9·3	23rd	9	155·4	1888	95·2	1885
November .	48·8	2·3 below	7·2	30th	13	66·9	1890	32·0	1888
December .	70·5	7·8 above	7·2	5th	10	80·1	1891	38·0	1890
Annual ...	1805·1	169·7 above	14·7		60	...	...	...	...

Bright sunshine was usually above the average for the first eight months of the year. This year is the second, during the last seven, wherein the sunshine value rose above 1,800 hours.



TABLE VII.  
RAINFALL, HUMIDITY AND DEWPOINT.  
*Five Years' Average, 1888 to 1892.*

MONTH.	DECADES INCLUSIVE.			THE MONTH.	9 a.m.		9 a.m.	
	First.	Second.	Third.		Humidity.	Dew-point.	Humidity.	Dew-point.
January .....	0·52	0·25	1·32	2·09	88	35·8	88	36·5
February .....	0·32	1·19	0·23	1·74	87	34·6	88	35·2
March .....	1·09	0·73	0·64	2·46	84	35·4	86	35·6
April .....	0·43	0·63	0·98	2·04	83	40·1	83	39·5
May .....	0·56	0·76	0·35	1·67	81	47·2	84	46·9
June .....	0·54	0·36	1·05	1·95	82	52·2	85	51·8
July .....	1·37	0·92	1·19	3·48	84	54·6	85	54·7
August .....	0·80	1·18	1·64	3·62	80	54·0	83	54·4
September .....	0·37	0·57	0·54	1·48	79	52·0	82	51·8
October .....	2·15	1·21	1·62	4·98	82	45·2	83	45·5
November .....	1·41	0·69	0·81	2·91	86	40·2	87	42·3
December .....	1·10	0·50	0·66	2·26	86	37·4	84	36·2
Annual .....	...	...	...	30·68	83	44·1	85	44·2

*Note.*—Saturation being represented by 100, the above humidity figures are percentages. The dew point is in degrees Fahrenheit.

TABLE VIII.  
RAINFALL AND HUMIDITY  
(With the Duration of Rainfall derived from Tomes' Patent Gauge).

MONTH.	RAINFALL FOR 1892.				HUMIDITY (100 saturation).		DURATION.		
	Inches and Hundredths.	Above or below the Average.	No. of days Rain fell.	Heaviest fall in one day.	9 a.m.	9 p.m.	During Day Hours.	During Night Hours.	Total Hours.
January .	1·00	1·09 below	10	0·45	84·4	84·5	...	...	...
February .	1·35	0·35 below	16	0·29	87·1	86·0	22·7	15·5	38·2
March ...	1·30	1·16 below	8	0·51	84·8	83·5	13·5	6·8	20·3
April .....	2·02	0·02 below	8	0·72	79·6	80·4	9·0	8·7	17·7
May .....	0·35	1·32 below	4	0·15	78·3	83·7	6·5	0·0	6·5
June .....	2·05	0·10 above	12	0·64	80·5	86·3	2·9	12·1	15·0
July .....	2·28	1·20 below	9	0·68	75·6	83·0	16·1	13·1	29·2
August ...	3·70	0·08 above	15	0·79	81·9	85·3	13·2	12·7	25·9
September	2·66	1·18 above	11	0·65	80·0	84·2	10·5	14·4	24·9
October .	6·44	1·46 above	19	1·20	83·2	84·3	33·6	31·3	64·9
November	3·35	0·44 above	17	0·80	90·3	90·6	23·3	17·3	40·6
December	3·21	0·95 below	11	0·71	83·1	84·2	21·6	22·2	43·8
Annual ...	29·71	0·91 below	140	1·20	82·4	84·6	*172·9	*154·1	*327·0

\* Eleven months only.

Rain fell on 140 days, the mean amount per fall being less than a quarter of an inch (0·21). The duration of rainfall is derived from Tomes' patent gauge, which was not at work in January.

TABLE IX.  
DIRECTION OF WIND.  
*Averages for Five Years.*

MONTH.	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Calm.
January .....	8.8	4.6	2.3	2.8	4.0	9.6	14.0	8.2	7.7
February .....	12.1	8.2	3.8	2.4	1.1	3.0	8.6	10.9	5.9
March .....	10.6	7.8	4.1	1.8	2.7	9.0	12.6	7.3	5.7
April .....	10.4	9.7	6.2	1.6	2.9	7.1	8.9	5.9	7.0
May .....	6.7	8.0	5.5	2.3	3.5	12.3	8.0	4.4	11.0
June .....	8.8	7.3	2.9	0.8	2.5	11.8	13.5	3.6	8.0
July .....	3.9	2.7	2.9	0.9	2.4	14.0	20.6	9.5	5.1
August .....	5.0	4.5	2.0	1.2	2.4	14.6	17.9	5.7	8.6
September .....	11.0	4.5	2.8	2.0	3.5	9.8	12.4	6.2	7.8
October .....	7.7	5.7	3.1	1.3	5.3	10.9	10.7	11.5	3.7
November .....	10.0	4.3	4.7	2.9	4.3	9.5	10.6	8.1	5.3
December .....	9.8	5.5	4.1	4.5	4.4	10.3	10.5	3.7	7.1
Annual .....	104.8	72.8	44.4	24.5	39.0	122.9	148.3	85.0	82.9

*Note.*—The observations have been reduced to eight points. This table shows that, although exposed to the east, Eastbourne receives its prevailing winds from the south-west and from the west. The figures give the average numbers of the occasions on which each wind was recorded.

TABLE X.  
THE WINDS

(Observed at 9 a.m. and 9 p.m. daily to the sixteen points, but in Table reduced to eight points of the compass).

MONTH.	VELOCITY IN MILES.		DIRECTION OBSERVED AT 9 A.M. AND 9 P.M. NUMBER OF OBSERVATIONS.										MEAN FORCE FROM 9 CALM TO 12 HURRI- CANE.	
	Total.	Mean per day.	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Calm.	9 a.m. mean.	9 p.m. mean.	
January ...	8,320	268	5	3	2	5	2	4	25	11	5	2.7	2.6	
February ..	7,169	247	5	4	3	3	2	6	13	12	10	2.5	2.4	
March ...	10,371	335	14	15	9	1	2	6	3	6	6	3.4	2.5	
April .....	6,904	230	12	15	4	0	2	3	11	8	5	2.5	1.8	
May .....	7,028	227	6	10	6	2	4	14	8	2	10	2.7	2.2	
June .....	7,630	254	4	5	6	1	4	12	22	3	3	2.9	2.4	
July .....	8,440	272	9	7	7	3	2	9	11	5	9	3.0	2.4	
August ...	7,010	226	4	2	1	1	4	17	17	2	14	2.6	2.1	
September	6,520	217	3	0	0	0	2	16	23	7	9	2.9	1.8	
October ...	7,487	241	10	3	2	4	5	11	13	11	3	3.2	2.7	
November .	5,760	192	6	2	5	4	9	7	9	3	16	2.4	1.8	
December .	10,170	328	8	2	3	5	1	5	20	13	5	2.9	3.3	
Annual ...	92,809	253	86	68	50	29	41	110	173	83	95	2.8	2.3	



The average velocity of the wind for the whole year was ten and a half miles per hour; the great preponderance of winds were from due west.

TABLE XI.  
TEMPERATURE OF THE SEA  
(In Degrees Fahrenheit).  
*Pier Head, Eastbourne.*

MONTH.	ABSOLUTE 1892.				MEAN 1891.		HIGHEST AND LOWEST MEAN IN FORMER YEARS.			
	Highest.	Date.	Lowest.	Date.	In Degrees and Tenths.	Difference from day to day.	Highest.	Year.	Lowest.	Year.
January ...	45	1st	38	16th	40·8	0·47	45·0	1890	34·5	1891
February ...	43	9th	36	19th	40·8	0·66	43·7	1885	37·4	1888
March .....	42	26th	36	13th	38·8	0·50	44·5	1885	36·1	1888
April .....	48	26th	41	1st	45·0	0·63	48·5	1884	41·6	1888
May .....	59	31st	47	1st	51·6	0·51	54·5	1890	50·5	1891
June .....	61	29th	55	5th	57·7	0·43	60·2	1884	55·9	1888
July .....	63	17th	60	5th	61·2	0·60	64·6	1884	58·6	1888
August ...	65	24th	62	7th	63·2	0·52	67·0	1884	60·1	1888
September .	63	2nd	58	8th	60·6	0·44	63·8	1884	58·8	1888
October ...	59	1st	45	26th	52·0	0·62	56·3	1891	51·0	1887
November ...	52	6th	48	26th	50·3	0·43	50·3	1892	46·1	1891
December...	49	2nd	38	28th	43·9	0·61	48·7	1884	38·0	1890
Annual ...	65		36		50·6	0·53	67·0	1884	34·5	1891

The absolute highest temperature over eight years was 70°, observed on August 11th and 12th, 1884, and the absolute lowest over the same period was 31°, observed on January 19th, 1891.

The mean temperature of the sea for 1892 was 1·2° higher than the mean temperature of the air.

#### REPORT DRAWN UP BY THE EASTBOURNE MEDICAL SOCIETY ON THE LOCAL PREVALENCE OF, OR IMMUNITY FROM, DISEASES.

In response to the invitation of the Climatological Committee of the Royal Med. Chir. Society, the following report has been drawn up by the Eastbourne Medical Society.

I.—*a.* Anæmia is not uncommon in Eastbourne amongst young women, newly resident, especially of the servant class. The effect of the climate is good in many cases.

*b.* Scrofula and tubercular diseases are infrequent among residents, and the climate has a very good effect.

*c.* With regard to diseases of the respiratory organs, phthisis is infrequent among residents, and bronchitis and catarrh below the

average; the climate is beneficial in these affections. Pleurisy is not prevalent; pneumonia is not uncommon in the spring; the effect of the climate is good. Asthma is uncommon among residents; the effect of the climate variable according to individual idiosyncrasy—especially beneficial in the case of children.

*d.* Acute nephritis is very uncommon, and there is no reason to suppose that chronic albuminuria is above the average. Renal calculus is exceedingly rare, whilst bladder calculus is almost unknown. The climate is beneficial in chronic albuminuria.

*e.* Acute rheumatism is rare; muscular rheumatism, rheumatoid arthritis, and neuralgia more common. In acute rheumatism the effect of the climate is good; in more chronic cases there is less benefit.

*f.* Skin diseases, particularly eczema, are uncommon; the climate is generally beneficial.

*g.* Malarial affections are almost unknown; typhoid fever is very uncommon; diarrhoea is uncommon, except of the ordinary summer type; scarlet fever is uncommon; diphtheria not common except during the epidemic of 1889, 90, 91.

II. Appended are reports on the climate and geological formation of the district, by Mr. G. F. Chambers, F.R.A.S., and the weather, by Mr. R. Sheward, F.R.Met. Soc., published by authority (see above).

III. The following statement as to the water supply is extracted by the writer from Mr. Sheward's report on the meteorological observations for 1892:—

“The water supply of Eastbourne is from wells sunk in the deep chalk. The water so obtained is of exceptional purity, and is laid on as a constant supply to all parts of the borough.”

IV. The drainage system is described by a resident in the following terms:—

“The drainage has been recently rearranged on the separate system, and the surface-water from roads now falls direct into the sea, whilst the house-sewage is taken in three independent sewers to a station at the east end of the borough, whence it is discharged into the sea at all states of the tide by Shone's automatic ejectors. The outfall is at Langney Point, a couple of miles east of the pier.”

The domestic refuse of the borough is destroyed in a “Destructor” furnace fitted with special contrivances to prevent nuisances from smells and dust.



## EASTBOURNE.

## I.

MONTHLY MEANS FOR TEN YEARS (1880—1889), OR AS MUCH OF THAT PERIOD AS COULD BE OBTAINED.  
*From Tables specially prepared for the Report to the Royal Medical and Chirurgical Society.*

MONTH.	TEMPERATURE OF AIR IN MONTH.						Mean Pressure of Atmosphere in Month. (9 a.m. and 9 p.m.)	WIND. (9 a.m. and 9 p.m.)					Mean Ozone. (9 a.m.)	Mean Cloud. (9 a.m.)	RAIS.			
	Highest.*	Lowest.*	Range.	Mean of Highest.	Mean of Lowest.	Mean Daily Range.		Mean Temperature of Air in Month.	Mean Relative Humidity. (9 a.m.)	Mean Maxima in Sun.	Amount of Sunshine.*	Calm.			N.	E.	S.	W.
January ..	49.8	17.5	32.3	42.4	33.1	9.3	°	37.8	90	60	Hours.*					7.4	14	1.73
February ...	52.9	17.9	35.0	42.3	33.1	9.2	°	37.7	85	62						7.4	16	1.96
March .....	54.8	21.3	33.5	44.8	34.1	10.7	°	39.5	81	103						7.7	18	2.33
April .....	62.1	26.2	35.9	50.3	38.4	11.9	°	44.3	77	159						7.1	18	1.71
May .....	75.6	34.4	41.2	59.1	45.9	13.2	°	52.5	74	210						6.7	12	1.28
June .....	81.2	43.2	38.0	65.8	51.3	14.5	°	58.6	74	220						6.3	9	1.22
July .....	80.7	40.6	40.1	66.5	54.2	12.3	°	60.3	78	221						6.8	15	2.82
August .....	79.2	43.4	35.8	66.4	53.4	13.0	°	59.9	76	197						6.3	15	2.26
September .	78.1	35.0	43.1	62.8	50.0	12.8	°	56.4	78	163						5.8	13	1.83
October ...	61.7	28.0	33.7	54.9	42.3	12.6	°	48.6	83	119						6.0	17	4.31
November .	60.0	28.4	31.6	50.0	42.6	7.4	°	46.3	87	50						8.2	17	3.35
December .	53.9	24.5	29.4	44.7	36.8	7.9	°	40.8	86	61						7.4	17	2.13

\* The Sunshine Observations are for the Years 1886—1889.

## EASTBOURNE.

## II.

QUARTERLY AND YEARLY MEANS FOR TEN YEARS (1880—1889), OR AS MUCH OF THAT PERIOD AS COULD BE OBTAINED.

*From Tables specially prepared for the Report to the Royal Medical and Chirurgical Society.*

Quarters and Year.	Mean Pressure of Atmosphere in Month (9 a.m. and 9 p.m.)	TEMPERATURE OF AIR IN MONTH.							Amount of Sunshine.*	WIND. (9 a.m. and 9 p.m.)					RAIN.	
		Highest.*	Lowest.*	Range.	Mean of Highest.	Mean of Lowest.	Mean of Daily Range.	Mean Relative Humidity. (9 a.m.)		Mean Maxima in Sun.	Mean Ozone.	Mean Cloud (9 a.m.)	Days it fell.	Inches.		
Jan.—March.		54.8	17.5	37.3	43.2	33.4	9.8	85	225			7.5	48	6.02		
April—June.		81.2	26.2	55.0	58.4	45.2	13.2	75	589			6.7	37	4.21		
July—Sept.		80.7	35.0	45.7	65.2	52.5	12.7	77	581			6.3	43	6.91		
Oct.—Dec.		61.7	24.5	37.2	49.9	40.6	9.3	85	230			7.2	51	9.79		
Whole Year.		81.2	17.5	63.7	54.2	42.9	11.3	81	1625			6.9	179	26.93		

\* The Sunshine Observations are for the Years 1886—1889.



SEAFORD.<sup>1</sup>

A small but growing town of 2,500 inhabitants, midway between Brighton and Eastbourne, distant 59 miles (by rail less than two hours) from London. Seaford, first mentioned as early as 1058 in the "Acta Sanctorum," was at one time a Cinque Port, until the Ouse altered its course, and is still known as the Town and Port of Seaford. It possesses two large convalescent homes. The Seaside Convalescent Home claims to have been the first of its kind established in the county (in 1860). The Surrey Convalescent Home is of recent foundation.

*Geology and Climate.*—The soil is dry, like that of the rest of the downs, being mainly chalk. The climate is described as equable and "tonic," with temperate summers as well as winters.<sup>2</sup>

The mean temperature at 9 a.m. for the six years 1885-90 is given by Dr. Pringle Morgan as 50·26°, and the mean height of the barometer as 29·942.

The average rainfall for the same period was 28·201 inches, with 24·33 (in 1887) and 35·50 (in 1888) as extremes. The comparative smallness of the rainfall is in part accounted for by the high ranges of Downs on either side which attract the clouds away from the town, and partly by the absence of trees, which is one of the features of South Down scenery.

The prevailing winds are south and west. From the north and east winds the town is considerably protected by high downs.

The amount of sunshine is very great. There are no high

<sup>1</sup> For most of the information concerning Seaford, the Reporter is indebted to Dr. W. Pringle Morgan, B.A., M.B., B.Ch., D.P.H., &c., District Medical Officer.

<sup>2</sup> The following is the description with which the Reporter has been favoured by Dr. Wm. Pringle Morgan and Dr. J. C. Sawyer, Resident Medical Officer at the Convalescent Hospital and Medical Officer of Health for West Fife:—

"The climate of Seaford is equable, but bracing for a south coast health resort. It is never very cold in winter, and in summer the heat is always tempered by a cool sea breeze, so that even the hottest days in summer are not relaxing.

"It is a climate eminently suited to convalescents, providing they are strong enough to bear the journey. The air has a true 'tonic' effect on such patients, and produces a really marvellous improvement in a short time.

"The climate is dry, rainfall being small, and owing to chalky subsoil quickly absorbed; there is a large amount of sunshine enjoyed and nothing to intercept it; no trees and no high hills.

hills to the west to cut off the evening light, and in the winter the sun sets in the ocean.

*Drainage.*—Prior to the year 1868, when a very thorough system of tubular drainage was adopted, every house had its own well sunk in the chalk, and its own cesspool or cesspools in close proximity to the well. The sewage is now discharged into the sea beyond low water mark, at a spot about half a mile from the centre of the town, being let free as the tide commences to rise, so as to be carried up channel away from the town and beach. Sewers are laid in all the streets. There are two flushing-tanks in use.

*Water-Supply.*—A constant and unlimited water-supply is obtained from a reservoir on the Downs, two and a half miles north of the town, which is fed from wells in the chalk, 150 feet deep. The water is pure but hard. In summer the streets are kept constantly watered.

The bathing is good on a clean shingly beach.

#### ANALYSIS OF THE SEAFORD WATER COMPANY'S WATER.

Total solid residues per imperial gallon	...	...	23·4 grains.
			Grains per gallon.
Carbonate of lime	...	...	8·3
Sulphate of lime	...	...	6·2
Chloride of sodium	...	...	4·7
Organic matter	...	...	3·7
Silica	...	...	—
			<hr/> 22·9 <hr/>

Ammonia ... .. 0·3 parts per million.

Albuminoid ammonia ... .. 0·2       "

Total hardness = 15·3, the average hardness of Brighton water.

Permanent hardness = 7·2 degrees of Clarke's scale.

Besides the picturesque village of Blatchington, more distant objects of interest are not lacking at Alfriston, Littlington, West Dean, etc., and the breezy downs offer invigorating walks and rides. Among the healthful attractions should be mentioned the lawn tennis and the golf clubs. The Seaford links are on the Downs overlooking the sea, not more than ten minutes' walk from the town.

#### *The Local Prevalence of, or Immunity from Diseases.*

*Anæmia and Debility* are fairly common among residents, chiefly in girls between fourteen and nineteen. Anæmia is very amenable



to treatment. Among visitors (those in the Convalescent Hospital are largely cases of anæmia) the benefit is marked.

*Scrofulous and Tuberculous Diseases.*—Among residents these are almost unknown. Scrofulous patients sent to Seaford improve greatly.

*Diseases of Respiratory Organs:*—(1) Phthisis.—During five years there were fourteen deaths from phthisis, four of these were those of visitors; none of them presented hæmoptysis. Seaford is suitable for phthisis from the beginning of June till Christmas, or even later in early cases; the great drawback is a prevalence of strong winds, and the climate is not favourable to cases far advanced. The atmosphere is clear and bright, with abundant sunshine.—(2) Bronchitis and Catarrh.—Not unusually prevalent among inhabitants. Visitors who have suffered must be genuine convalescents; if so, the climate will help them much.—(3) Pneumonia.—Not very common among inhabitants. Never epidemic. Convalescents sent to Seaford do well. (4) Pleurisy.—Uncommon. (5) Asthma.—Uncommon among inhabitants; no evidence as to effect on visitors.

*Renal Diseases:*—(1) Acute Renal Dropsy.—Very uncommon; one case only (after scarlatina) in four and a half years.—(2) Chronic Albuminuria.—Very uncommon.—(3) Calculus and Gravel.—No cases seen.

*Acute Rheumatic Fever.*—Not common among inhabitants. All cases do well. *Chronic Rheumatic Arthritis.*—As a rule improves, probably owing to dryness of climate, small rainfall, and chalky subsoil.

*Skin Disease.*—Uncommon.—Climate unsuitable for eczema.

*Endemic Affections.*—Malaria unknown.—Typhoid Fever and Diarrhœa uncommon.—Scarlet Fever: A few cases seen during the last twelve months for the first time for some years; most of them exceedingly mild. The cases were imported and spread through the schools.—Diphtheria very uncommon, never epidemic. The rare cases noted have been traced to local insanitary condition.—Endemic sore throat unknown.

The great age to which many inhabitants live is quite proverbial. The common causes of death are those incidental to the extremes of life.

The death-rate of Seaford has always been remarkably low, and

the attainment of a great age by its inhabitants common. Thus, during the fourteen months from January 1890 to February 1891 inclusive, there were no fewer than 15 deaths of persons over 70 years of age; six of these were over 80, and one was 101 years. The actual death-rate, including visitors as well as residents, was in

1885	...	...	14·13	per 1,000 living.
1886	...	...	20·00	"
1887	...	...	14·69	"
1888	...	...	15·26	"
1889	...	...	15·26	"

### BRIGHTON.

(The reporter is indebted for many of the particulars of this report to a paper on *The Geology and Climate of Brighton in Relation to Health*, by Edward Mackey, M.D., M.R.C.P., recently President of the Brighton Medico-Chirurgical Society. He also wishes to express his thanks for assistance courteously rendered by Dr. Arthur Newsholme, M.R.C.P., &c., Medical Officer of Health.)

Brighton combines with the advantages of a seaside position some of the peculiarities of a large town, and extending as it does some distance inland it presents great varieties in the individual aspect, in the altitude and in the distance from the sea of particular sites. To confine ourselves for the present to that portion which is nearest the sea, we may almost divide it into three towns, Kemp Town at the east, Hove at the west, and Central Brighton. This division is borne out not only by the geology and the altitude, but to a certain extent also by some of the peculiarities of architecture and general aspect. It is remarkable that so large a town should have developed at so great a distance from any river. A stream at one time did flow along the valley between the two cliffs, and it is thought that Poole Valley, perhaps a silted-up harbour, was at its mouth. Somewhat earlier than one hundred years ago a piece of water existed on the Steine, but this was drawn away into a sewer at the end of the last century. Practically at the present time the long sea front, extending from Hove to Kemp Town, is uninterrupted by any river or water-course finding its way into the sea.

The general features of the town can hardly be described in a few lines. The essential points will be noticed under the heading Geology.



*Geology.*—In general terms the eastern extremity as well as the downs of the north-west have a subsoil of chalk with a fine covering of earth. The central district of the Old Steine and of the valley extending towards Preston has alluvial soil, shingle, and marl. Hove is built on an extensive thickness of clay, between two and twenty feet deep, and clay also extends on the Stamford and Aldrington estates.

More precisely the East Cliff must be described as partly consisting of a coarse conglomerate known as "elephant bed." This and the chalk proper constitute a dry and porous formation considered absolutely healthy. Chalk is again found towards the west, up North-street and Queen's-road.

Patches of clay begin to appear in Russell-street and in West-street, and beyond the West Pier they gradually form the main proportion of the low-lying land along the front. Brunswick-square and Palmeira-square are built where brickfields formerly existed and the foundations are probably in part dug out of clay. From West-street to Portslade the soil is almost entirely marl and clay.

The chalk down known as the Montpelier district, rising to a height of more than 100 feet at the north and west of Regency-square, presents a large patch of surface clay at its summit.

Furze Hill, with mineral springs and a damp subsoil, is said to be a volcanic formation. The valley intervening at the centre of Brighton consists mainly of shingle and marl with patches of clay. The air is moister, and mists or even fogs are more frequent.

*Meteorology.*—Brighton is favoured in the possession of an aspect south and south-west, and with the advantages arising from the slope of the chalk downs and the open valley dividing the town. The Brighton sky is famed for its clearness and brightness, and Brighton air for its bracing quality.

From observations collected by the late Mr. F. E. Sawyer in the Montpelier district, at an elevation of 200 feet, during the period 1868–1880, it appears that the daily range was 11·7 (at Greenwich 16, at Uckfield 17). The highest temperature was 86·7 (July 1868), the lowest 11·4 (January 1880), and the yearly range was 75. The mean temperature was 50° in the shade (Greenwich

mean for sixty years 49·1, Plymouth for sixteen years 51·6, Eastbourne for a shorter period 51). The mean humidity was found to be 82, the driest month being May, the most humid January. The mean monthly rainfall was 28·87 inches, the average of rainy days 164. Land fogs are uncommon, and it is observed that morning and evening mists are dispersed also and set in later than in many places.

The rainfall north of the Downs is known to be much more considerable, its maximum being attained at Crowborough. It need hardly be said that the porous and sloping character of the ground causes the rain to dry rapidly. The mean barometric pressure for nine years ending in 1880 was 29·961.

*Winds.*—From the *Meteorological Observations* in 1890 (see Table).—The prevalent winds were south-west and west (seventy-four days), the north-east (fifty-four days), and the east (twenty-three days); the north wind prevailing in November, the north-east in March and May. The south-west blowing from the sea is cool in summer, whereas the south-east crossing from the Continent causes the summer nights to be hot.

It is seen that the most prevalent wind was the south-west; the north-west and north-east following each other closely in their frequency at a considerable distance from that of the south-west wind. Dead calm prevailed during forty days, the west and the south-east during twenty-seven days each, the north during fourteen days, the south during twelve days, and the east during eight days only.

*Report on the Medical Climatology of Brighton. By a Sub-committee of the Brighton and Sussex Medico-Chirurgical Society.*

In this report we have followed the headings given in the circular of the Royal Medical and Chirurgical Society.

I. *The prevalence of, or immunity from diseases in Brighton.*—*Anæmia*<sup>1</sup> is common in Brighton as elsewhere, but no

<sup>1</sup> In a separate report Dr. Adolphus J. Richardson communicates important results from an investigation of 179 cases of chlorosis among unmarried women between the ages of fifteen and twenty-seven, free from evidence of other disease, in which the percentage of hæmoglobin was below 50 per cent. of the normal male standard.

1. *Local Prevalence*.—Of the 179 cases in 121 chlorosis originated in Brighton, 22 in surrounding inland villages, 18 in coast villages, and 18 in other localities. In order to test the reality of this apparent prevalence of chlorosis in Brighton, Dr.



exact statistics are available. The prevalent form of anæmia is chlorotic, which readily yields to treatment. It chiefly occurs among those whose occupation confines them indoors. Patients visiting Brighton with anæmia rapidly convalesce, the climate appearing to stimulate and improve assimilation.

*Scrofulous and Tuberculous Diseases* are frequently returned as the cause of death in Brighton. We are of opinion however that any exact figures on this point would be misleading, inasmuch as patients suffering from these diseases, sent as visitors, frequently become permanent residents and die here. This is true not only among the well-to-do, but also among the poor, who ultimately find their way to the Brighton Workhouse.

The consensus of opinion appears to be that strumous glandular and other diseases are comparatively seldom developed in Brighton. Delicate children are sent in large numbers to school at Brighton on account of strumous tendencies, and do extremely well, the climate appearing to be most favourable to recovery from all scrofulous diseases. Cases of phthisis do well in Brighton. In early phthisis, under favourable conditions, the symptoms appear to become quiescent. The climate for such cases is best from May to December.

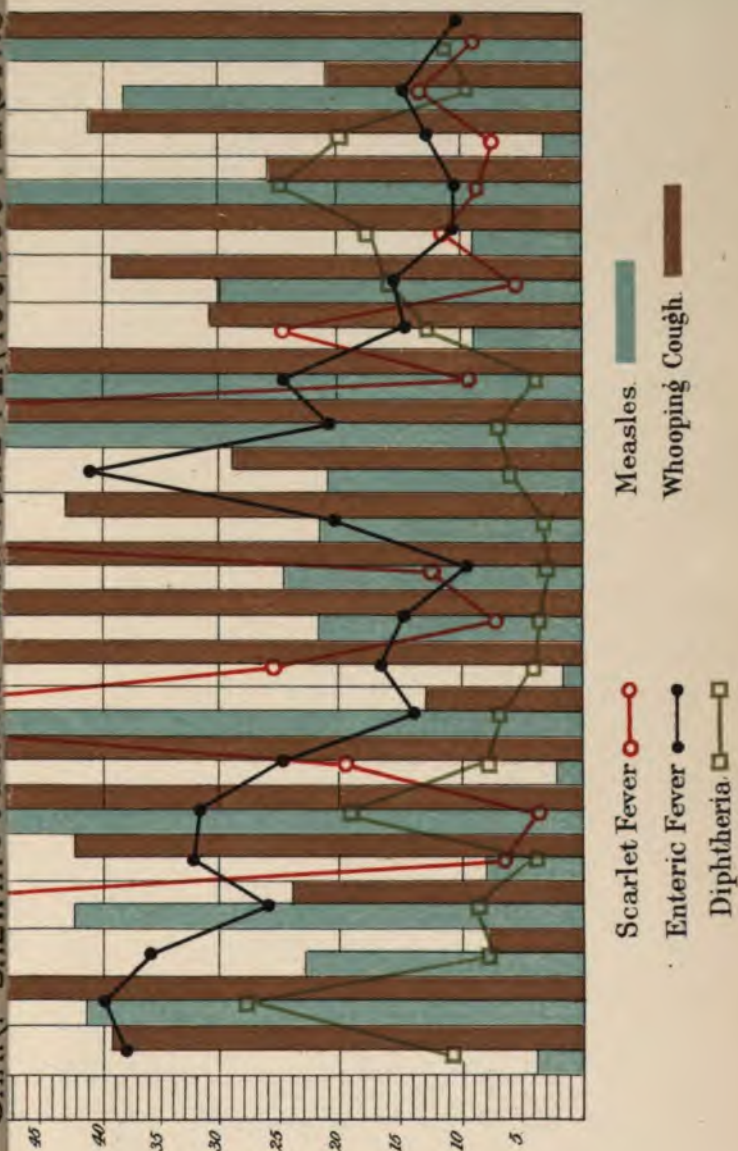
Hæmoptysis is a comparatively rare symptom.

*Diseases of the Respiratory Organs.*—Here again, and in later paragraphs, the remarks as to visitors under the head of

Richardson made another series of observations of 390 unmarried women between the same age limits, suffering from various diseases. It was found that the individual ailments had originated in 329 cases at Brighton, in 39 at surrounding villages, in 16 at coast villages, and in 16 elsewhere. In percentages the non-chlorotic series gave 84·3 for Brighton, 10 for the surrounding villages, 4 for the coast villages, 1·5 for other places, whereas percentages in the chlorotic series were 67·6, 12·2, 10·1, 10·1, from which it would appear that the large number of cases under treatment results from the accession of cases from outside.

II. *Local Benefit Obtained.*—In all the cases Bland's pill was given. The hæmoglobin was determined on the first attendance and again after five or six weeks. The weekly improvement, measured by the increase in hæmoglobin divided by the number of weeks since the first determination, was for the 49 cases living in Brighton 4·59, for 16 cases in surrounding villages 4·876, for 13 cases from the coast villages 4·616, for 11 cases from elsewhere 3·777. Assuming that the cases were all of fairly even gravity, it may at least be said that the rate of recovery in Brighton is favourable; and we may perhaps also conclude that any differences in the gravity of the cases would be in favour of residents at Brighton and near Brighton, as opposed to visitors from a distance.

CHART SHEWING ANNUAL DEATH-RATE PER 100,000 PERSONS







scrofulous diseases hold good, many persons visiting and settling in Brighton on account of one or other of these diseases. Bronchitis occurs as elsewhere during the winter months. Pneumonia, until the recent epidemic of influenza, has been comparatively rare. Cases of asthma frequently do extremely well, but the results are variable.

*Renal Diseases* appear to be very rare. Cases of granular kidney are infrequent. Hospital statistics show that calculus is very rare in Brighton.

*Rheumatism* is not specially prevalent in Brighton, and what there is occurs mostly amongst the poorer classes. The soil being porous and dry, this prevalence of rheumatism does not hold good among those living under favourable conditions.

Rheumatoid arthritis is not, so far as we are aware, peculiar to any climate, and Neuralgia originates from such varied causes that any general statement on these points seems impossible. It can only be said that, when these are associated with or caused by general debility or anæmia, the climate of Brighton is very helpful.

*Diseases of the Skin* appear to be exceptional. The hard water is somewhat unfavourable in their treatment.

*Endemic Diseases.*—Malarial affections never occur in Brighton except when imported, as among Anglo-Indians.

Enteric fever, as shown in the accompanying table and in the preceding chart, is steadily declining; and the death-rate from this disease is the lowest of any of the twenty-eight great towns.

Scarlet fever in like manner is on the decline, and a very considerable proportion of the cases occurring are imported from London and elsewhere. Much of this decline may be ascribed to the increasing use made of the Isolation Fever Hospital, in which the majority of the cases occurring in the town are treated. The tracing on the chart shows that this increased use of the Fever Hospital has been associated with a failure of the periodical rise of the scarlet fever mortality which had previously occurred at intervals of about six years.

Diphtheria shows a very slight increase in mortality, but this slight increase compares very favourably with the great increase which appears to be manifest in nearly all parts of the country. The death-rate from this disease was 11·3 per 100,000 persons



last year in Brighton, as compared with 24·2 in the twenty-eight great towns, and 32·4 in London.

We know of no such disease as endemic sore throat, distinct and separate from diphtheria and follicular tonsillitis. If by this term is meant the sore throats which are sometimes associated with drain effluvia, there is a comparative absence of such ailments.

Diarrhœa causes the rise of summer and autumnal mortality among infants which occurs in all large towns. It is however decreasing in amount.

II. *The Common Causes of Death and Frequency of Old Age.*—The accompanying table gives a classification of the causes

ANNUAL DEATH RATE PER 100,000 FROM ZYMOTIC DISEASES.

	1861-70.	1871-80.	1881-84.	1885-88.	1889.	1890.
Smallpox ... ..	22	8	4·3	0·3	0	0
Measles ... ..	43	27	53·5	25·5	38	46
Scarlet Fever ... ..	63	39	47·7	8·7	14	9·7
Diphtheria ... ..	26	8	7·5	41·0	10	11·3
Whooping Cough ... ..	60	46	56·0	19·7	21	83·3
Fever (chiefly Enteric) .	53	24	25·5	12·7	15	10·5
Diarrhœa ... ..	121	106	66·7	63·7	55	76·0

of death in Brighton during the past year, and the number of deaths due to each disease or group of diseases. The same facts are stated graphically in the diagram. Any figures as to the "frequency of old age" would in our opinion be entirely misleading. Brighton is a favourite place for the retirement of aged persons, and it might reasonably be expected therefore that the number of deaths returned as due to "old age" would be proportionally large. It is notorious however that, with increased accuracy of certification on the part of medical practitioners, the tendency is to enter the immediate cause of death, such as "bronchitis," &c., omitting the predisposing condition of old age. On these grounds, any figures as to the relative "frequency of old age" in different health resorts would in our opinion be untrustworthy.

III. *The System of Drainage* adopted is the water-carriage system. Water-closets are used throughout the town; house drains are disconnected from the main sewer and ventilated; each

new drain is tested by the hydraulic test, to ensure its being absolutely water-tight.

The main sewers are freely ventilated by road grids and large shaft ventilators. Every sewer is flushed weekly throughout its whole length by a large volume of water introduced suddenly so as to cleanse the whole length of sewer.

The sewers of the town converge to the intercepting sewer, which runs parallel to the sea front to a point four miles beyond the extreme eastern point of the borough, and then empties into the sea below high water mark. The set of currents is such, and the distance is so great, as to preclude the possibility of any contamination of the sea near Brighton.

IV. *The Water Supply* is from deep borings with lateral tunnels in the chalk of the South Downs. The water supplied from this source is highly aerated and palatable to drink. It is absolutely free from organic matter, but contains a considerable amount of hardness, almost entirely temporary and removable by boiling. As there are only 12·8 grains of carbonate of lime and 5 grains of carbonate of magnesia with a minute quantity of sulphate in each gallon of water, obviously these can have no importance dietetically, though they might be disadvantageous if Brighton were a town devoted to industrial pursuits. The hard water ensures a complete immunity from the danger of lead-poisoning from water pipes.

V. *The Chief Meteorological Facts* are contained in the appended table. The table summarises the observations taken during the last fourteen years at the Corporation Meteorological Station in the Old Steine. The mean maximum and minimum temperatures and the amount of daily range are given for each month in the year. The relative humidity, the rainfall, and the number of rainy days (*i.e.*, days on which ·01 inch of rain fell) are also given. The number of days on which each kind of wind prevailed, and the monthly distribution of wind are also given. It will be seen that, taking the average of fourteen years, 131 days of west and south-west wind occurred per annum, 22 days of south wind, 51 of north-west wind, and 26 of south-east wind, the remaining 130 days (with the exception of 5 days calm) being north, north-east, or east winds.

Perhaps the number of hours of bright sunshine has a greater



METEOROLOGICAL TABLE.—SUMMARY OF FOURTEEN YEARS' OBSERVATIONS.

Extracted from the Report of the Sub-Committee of the Brighton and Sussex Medico-Chirurgical Society.

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Entire Year.
Temperature in shade 4 feet above sea level.													
Mean Minimum...	34.8	37.7	35.6	40.5	46.0	52.6	55.0	55.6	51.4	45.2	41.0	36.5	44.2
" Maximum	43.7	45.1	48.0	52.7	59.3	65.6	67.3	67.3	63.6	57.0	50.1	45.4	56.2
" Temperature	39.3	40.9	41.7	46.8	52.4	58.8	60.5	61.2	57.3	51.0	45.5	40.0	49.4
" Daily Range	9.9	7.4	12.4	12.2	13.3	13.0	12.3	11.7	12.2	11.8	9.1	8.9	12.0
Mean Rainfall in inches	2.83	2.28	1.82	2.03	1.93	1.90	2.44	2.59	2.62	3.84	3.61	2.49	30.43
Greatest Rainfall during 24 hours	1.50	0.79	1.00	0.86	1.41	1.15	1.47	1.79	1.11	1.70	1.78	1.32	1.79
Mean number of Rainy Days	15	14	12	12	11	11	13	12	12	15	16	14	163
Relative Humidity of Air	86	81	81	81	73	72	73	75	79	78	86	83	78
N. E.	3.3	3.0	3.2	3.0	2.7	2.4	1.6	2.5	3.7	4.2	3.0	3.9	36.5
N. E.	6.6	4.7	7.2	10.0	8.7	6.2	2.9	4.7	6.2	6.6	5.3	6.3	75.4
E.	1.9	1.6	2.2	1.6	1.4	1.4	0.9	1.5	1.2	1.9	1.1	0.9	17.7
S. E.	2.3	2.4	2.3	2.5	3.2	2.2	1.8	2.2	2.0	2.1	1.3	1.7	26.0
S. W.	2.6	2.2	1.2	1.8	2.6	1.8	1.8	1.2	1.6	1.6	2.3	1.8	22.5
W.	6.6	6.2	6.2	5.7	8.1	9.6	13.2	8.6	6.6	5.6	7.9	7.2	91.5
N. W.	2.6	3.6	2.9	2.5	1.6	2.6	4.8	5.4	3.6	3.6	3.6	3.4	39.0
N. W.	4.9	3.8	5.3	2.6	2.4	3.6	3.6	4.3	5.0	5.3	5.0	5.6	51.4
Calm	0.2	0.4	0.5	0.3	0.3	0.2	0.4	0.6	0.7	0.6	0.5	0.2	4.9
Hours of Bright Sunshine (1890)	62.8	103.4	133.7	176.2	267.1	176.3	184.0	209.2	164.7	124.1	64.0	35.0	1700.4

influence on invalids than any other single factor relating to climate. In this respect places on the south coast are highly favoured as compared with the rest of the country.

The accompanying table gives the number of hours of bright sunshine during 1890 in Brighton, Eastbourne, and Hastings respectively, and the number of sunless days in each.

NUMBER OF HOURS OF BRIGHT SUNSHINE DURING 1890.

	Brighton.	Eastbourne.	Hastings.
January ... ..	62·8	56·9	62·3
February ... ..	103·4	116·3	111·7
March ... ..	133·7	133·5	131·9
April ... ..	176·2	170·3	164·4
May ... ..	267·1	266·9	269·3
June ... ..	175·9	165·3	166·6
July ... ..	182·9	185·6	192·8
August ... ..	209·2	200·2	193·9
September ... ..	170·2	207·2	199·4
October ... ..	124·1	125·3	134·3
November ... ..	68·0	66·9	71·3
December ... ..	35·3	38·0	48·6
	1708·8	1732·4	1746·5

SUNLESS DAYS DURING 1890.

	Brighton.	Eastbourne.	Hastings.
January ... ..	11	10	12
February ... ..	5	6	7
March ... ..	5	4	6
April ... ..	5	6	7
May ... ..	1	1	1
June ... ..	3	1	2
July ... ..	0	2	1
August ... ..	0	0	0
September ... ..	0	1	1
October ... ..	5	8	7
November ... ..	10	9	9
December ... ..	21	19	18
	66	67	71



## THE CLIMATE OF SUSSEX

## RECORD OF TEMPERATURES OF THE SEA.

Kept by the Pier Master of the West Pier, Brighton.

		1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.	1889.	1890.
Jan. ...	{ Max. ...	48·0	44·0	48·0	45·0	43·5	43·0	41·0	42·0	43·0	47·5
	{ Min. ...	34·0	42·0	43·0	43·0	39·0	38·0	35·5	36·0	40·0	42·0
	{ Mean ...	39·3	40·9	46·0	44·2	41·1	40·3	38·6	38·7	41·1	44·7
Feb. ...	{ Max. ...	40·0	46·0	46·0	45·0	46·0	40·5	42·0	39·5	42·0	46·0
	{ Min. ...	36·0	42·0	44·0	43·0	42·0	38·0	37·5	34·5	37·0	40·0
	{ Mean ...	37·8	43·8	44·8	44·0	44·2	39·0	39·2	37·0	39·3	42·1
March...	{ Max. ...	45·0	50·0	45·0	48·0	46·0	44·0	42·5	40·0	42·0	47·5
	{ Min. ...	39·0	45·0	39·0	44·0	43·0	36·5	37·5	33·0	35·0	38·0
	{ Mean ...	42·9	48·2	41·6	46·1	44·2	38·7	39·4	36·9	38·7	43·1
April ...	{ Max. ...	48·0	53·0	49·0	50·0	52·0	48·5	47·0	45·0	50·0	49·5
	{ Min. ...	42·0	48·0	42·0	45·0	45·0	44·5	42·0	39·0	42·0	45·5
	{ Mean ...	45·0	50·3	46·0	47·4	47·3	46·1	43·9	41·7	45·5	47·3
May ...	{ Max. ...	56·0	59·0	56·0	57·5	57·0	55·5	51·5	53·0	58·0	57·0
	{ Min. ...	47·0	52·0	47·0	50·0	51·0	47·0	46·0	45·5	50·0	51·0
	{ Mean ...	53·2	56·6	53·4	53·9	52·6	51·6	49·3	49·6	54·2	54·0
June ...	{ Max. ...	64·0	63·0	62·5	61·5	60·5	60·0	59·0	58·0	63·0	69·5
	{ Min. ...	58·0	57·0	57·0	54·5	54·5	55·0	51·5	53·0	57·5	56·0
	{ Mean ...	60·6	58·9	58·8	57·6	59·1	57·2	55·6	55·3	59·2	59·9
July ...	{ Max. ...	65·0	65·0	64·0	65·0	65·0	64·0	65·0	60·5	65·0	65·0
	{ Min. ...	62·0	62·0	60·0	62·6	59·5	60·0	58·0	56·0	62·0	60·0
	{ Mean ...	64·0	63·2	62·2	64·0	61·2	62·5	61·2	58·9	62·4	62·1
Aug. ...	{ Max. ...	64·0	66·0	64·0	67·5	62·0	66·0	66·0	61·5	65·0	65·5
	{ Min. ...	60·0	61·0	60·0	63·5	59·0	62·0	61·0	59·0	61·0	62·0
	{ Mean ...	62·3	63·4	62·4	65·9	61·8	64·0	63·6	60·3	62·8	64·3
Sept. ...	{ Max. ...	62·0	63·0	63·5	64·0	62·0	66·0	63·0	60·5	64·5	63·5
	{ Min. ...	59·0	59·5	58·0	60·0	54·0	57·0	56·0	57·0	53·5	61·0
	{ Mean ...	60·2	61·1	60·0	62·0	56·8	62·0	58·5	58·7	60·2	62·1
Oct. ...	{ Max. ...	62·0	61·0	57·5	60·5	56·0	59·5	56·0	57·5	56·0	61·5
	{ Min. ...	50·0	53·0	52·5	52·0	49·5	50·0	47·0	48·5	53·0	50·0
	{ Mean ...	57·8	60·1	56·1	57·0	56·8	56·7	52·9	53·1	54·4	58·4
Nov. ...	{ Max. ...	53·0	54·0	52·5	55·5	51·0	53·0	49·5	53·0	53·0	54·5
	{ Min. ...	48·0	45·0	47·0	44·0	44·0	47·0	46·0	46·0	44·0	44·0
	{ Mean ...	53·6	49·8	49·9	49·6	48·0	49·1	48·2	49·3	50·7	50·3
Dec. ...	{ Max. ...	50·0	49·0	49·0	49·0	49·0	47·0	45·5	49·5	47·0	44·0
	{ Min. ...	43·0	43·0	42·0	43·0	41·0	40·0	38·0	43·0	42·5	35·0
	{ Mean ...	47·0	45·3	44·6	45·8	44·1	42·3	43·2	46·0	44·5	39·7

## METEOROLOGICAL OBSERVATIONS DURING 1890.

MONTH.	TEMPERATURE OF AIR DURING THE MONTH.				Mean Temperature of Air.	Mean Degree of Humidity, Saturation = 100.	WIND.										RAINFALL.	
	Highest.	Lowest.	Mean of				Number of Days of.										No. of days on which Rain fell.	Amount collected in inches.
			All Highest.	All Lowest.														
							N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Calm.			
January .....	54.2	30.5	48.9	40.7	44.8	90	0	2	0	1	4	13	3	6	2	22	2.96	
February .....	50.0	27.8	42.5	34.7	38.6	84	3	6	3	3	1	12	3	4	2	4	1.35	
March .....	56.2	20.2	47.4	37.6	42.5	86	0	2	0	2	1	12	4	4	6	13	1.58	
April .....	64.8	33.8	53.6	40.4	47.0	77	1	10	1	1	0	5	3	5	1	13	2.53	
May .....	78.1	39.8	60.0	47.9	58.9	83	0	8	1	3	2	7	3	5	2	9	1.78	
June .....	70.0	41.4	63.0	52.2	57.6	65	0	1	0	2	0	11	2	11	2	14	2.05	
July .....	74.5	47.4	66.5	54.0	60.2	78	3	0	0	1	0	12	3	3	7	12	2.50	
August .....	73.8	43.5	67.4	54.8	61.1	74	2	3	0	2	0	13	3	3	5	15	2.67	
September .....	74.1	40.4	67.1	54.8	60.9	75	1	3	1	6	2	8	2	3	4	8	0.83	
October .....	66.0	32.6	58.5	44.6	51.5	67	0	3	1	4	1	10	0	8	4	9	1.57	
November .....	57.3	17.9	50.0	38.7	44.3	84	1	5	0	0	1	8	1	12	2	20	3.32	
December .....	43.8	17.6	36.8	28.6	32.7	87	3	23	1	2	0	0	0	1	1	3	0.47	
Entire Year .....	...	...	55.1	44.1	49.6	77	14	66	8	27	12	101	27	70	40	142	23.61	

*Vital Statistics.*—Under this heading the following facts are brought to notice in Dr. Newsholme's Report for 1891:<sup>1</sup>—

The population at the census of April, 1890, was 115,401.

The birth-rate was 26.22 per 1,000 inhabitants, being lower than that of any of the twenty-eight large towns except Huddersfield (24.4) and Halifax (26.2), the highest being that of Sunderland (37.8), and the average being 32.6 (London 31.8).

The mortality of infants was 293 per 1,000 births among the illegitimate (constituting 7.1 per cent. of the total births) and 118 per 1,000 among the legitimate.

The death-rate was 18.20 per 1,000 inhabitants—lower than that of any of the twenty-eight large towns, as during the preceding years since 1884. The same remark applies to the zymotic and to the infantile death-rate.

The zymotic death-rate was 1.06 per 1,000 inhabitants, being the lowest recorded during the last ten years (the highest was 4.4 in 1882).

The infantile death-rate, under one year of age, was 137. The

<sup>1</sup> *Annual Report of the Health, Sanitary Condition, &c., of the Borough of Brighton, for the Year 1891.* By ARTHUR NEWSHOLME, M.D. Lond., M.R.C.P. &c., Medical Officer of Health.



lowest during the last ten years was 128 in 1881; the highest, 187 in 1882.

Of the total deaths (2,097) 167 were due to old age, 28 to measles, 21 to pertussis, 13 to enteric fever, 12 to diphtheria, 47 to diarrhœa, 1 to scarlet fever, 2 to puerperal fever, 4 to erysipelas, 15 to other zymotic diseases, 71 to influenza, 166 to phthisis, 24 to tabes mesenterica, 39 to brain tubercle, 30 to other tubercular affections, 104 to malignant diseases, 25 to gout and rheumatism, 16 to other constitutional diseases, 16 to dietetic disorders, 42 to convulsions, 202 to other nervous diseases, 3 to diseases of the organs of special sense, 201 to diseases of the circulation, 381 to diseases of the respiratory system, 136 to diseases of the digestive system, 19 to diseases of the generative system, 60 to diseases of the urinary system, 11 to diseases of the locomotory system, 5 to diseases of the integumentary system, 2 to diseases of the lymphatic system, 86 to premature birth and low vitality, 20 to congenital malformations, 57 to violence, 71 to ill-defined causes.

The ages at death were:—0—1 year in 417 cases, 1—5 in 200, 5—15 in 68, 15—25 in 89, 25—35 in 118, 35—45 in 152, 45—55 in 200, 55—65 in 232, 65—75 in 304, 75—85 in 236, 85 and upwards in 81.

*Hospitals and Convalescent Homes in Brighton.*—The main hospitals are as follows:—Sussex County Hospital (accommodates 173 in-patients). Royal Alexandra Children's Hospital. Sussex Eye Hospital. Throat and Ear Hospital. Borough Sanatorium (for cases of fever, 110 beds).

*Convalescent Homes:*—Crescent House, Marine Parade (over one hundred beds). Home for invalid children, Montpelier Road (twenty beds). Miss Marsh's Convalescent Home, Black Rock. St. Bernard's Home for gentlewomen, 106 Lansdowne Place. St. John's Home for children, Kemp Town (fifty children). There is a large number of other convalescent and invalids' homes.

#### *Climatic Indications and Contra-Indications.*

*Climatic Indications.*—The seasons of the year have to be studied by the delicate, although for those who are strong Brighton may be recommended as a safe residence. The autumn is recognised to be the best season for health at Brighton. During the winter Brighton shares with other seaside towns the

warming influences of the sea, especially at night. The night temperature of Brighton is for this reason at least 4° warmer than that of London. In spring it is the practice, especially at the East Cliff, for invalids to leave Brighton. The Steine and the neighbouring district facing the sea are not open to the same objection; but there is danger for many in walking in the teeth of the north-east wind. Attacks of erysipelas, jaundice, or pleurisy, are said to be sometimes contracted in that way.

In summer the cooling influence of the sea is a boon so long as the wind blows from the west or south-west; but south or south-east winds are hot and depressing, and apt to bring sea fogs. At times the heat and the glare are seriously complained of by visitors and mild cases of diarrhœa or insolation may be traced to this influence combined with that of the cold sea water in which children bathe.

As already hinted, various climates may really be found within Brighton or its immediate neighbourhood, and the following suggestions must be framed in a general way to include all; but there are many invalids who will not be sufficiently independent of aspects and of winds to dispense with competent local advice.

In general, all strumous, scrofulous, and anæmic conditions are benefited at Brighton, and likewise convalescents from acute diseases, and, since ague is unknown, sufferers from malaria. Chronic congestive ailments, whether pleuritic or bronchitic, will do well during the suitable seasons; the same applies to consumption, although there is no specially curative virtue in the place for such cases. In all pulmonary affections, aspect and protection from winds will be of paramount importance.

*Contra-Indications.*—Contra-indications will be found in the individual case by experiment, for sufferers from apparently analogous affections may be influenced in very different ways. Sometimes the difference lies rather in the situation selected than in the other individual circumstances. It is well known that irritable dyspepsia, congestive headache and a tendency to biliousness are occasionally induced in visitors, and it may be safely concluded that Brighton cannot be recommended to those suffering elsewhere from these complaints. Residents in Brighton are very familiar with the local climatic distinctions between Hove and the East Cliff; and to each of these localities in the individual



case contra-indications will specially belong, but further detail would be out of place in this report.

Cutaneous affections, epilepsy, and other conditions ill-suited by marine climates are specially unsuitable for Brighton.

#### SHOREHAM.

Shoreham, a small sea-side town, which formerly possessed more importance relatively than it now does, before the days when Brighton rose into popularity, is situated due south of the break in the Downs caused, near Steyning and Bramber, by the valley of the Adur. Thus it is exposed to winds from due north, but it is protected east and west by southward spurs from the Downs, and from the north-east and the north-west it also receives shelter.

The smaller sea-side places which intervene between Shoreham and Hove, Kingston-by-Sea, Southwick, and Portslade, are again under shelter from the Downs and offshoots from them; but their approach to the sea is not favourable, and the beach consists of an awkward bank of shingle.

Shoreham rises but slightly above the level of the sea, and the interval between the town and the Downs is quite flat. From the latter it receives some protection on the north, north-east, north-west, and west sides. It is unprotected against winds from the south, south-west, south-east, and from the east. The prevailing wind blows from the south-west. The climate is described as equable.

The town is drained into the sea by gravitation.

The water supply is good and pure, being derived from deep springs in the chalk.

There is nothing special to note in connection with the prevalence of disease. The climate is regarded as suitable for pulmonary complaints.

#### WORTHING.

In the absence of any recent local report from Worthing the following brief extracts from Barker's interesting work<sup>1</sup> may be of some service.

<sup>1</sup> *On the Climate of Worthing: its Remedial Influence in Diseases, especially of the Lungs*, by Walter Goodyer Barker, M.B. Lond. &c. Second Edit. London: J. Churchill and Sons. 1867.

Worthing faces due south, or somewhat towards the west, and is therefore fully exposed to the sun's rays.

"Immediately contiguous to Worthing are the South Down Hills, which have an average altitude of about six hundred feet, the base of which is situated about a mile and a half from the sea and a mile to the north of the town; they run from east to west, not in a straight line, but somewhat in a semi-circle, and effectually shelter us from the winds that come from the north and north-east, and in a degree from the east and north-west winds; this is another of the causes of our small ranges of temperature."

"The bold headland of Beachy Head, 559 feet high, lying to the east-south-east, reduces considerably the force of the winds from that direction. To the south and the south-west winds, which are the most constant and the most equable, we are alone completely exposed; and it has been asserted that the promontory of Selsey Bill moderates in some degree the winds that come from this quarter."

"From the sea to the hills the country is a perfect level, and invalids are enabled to take a great variety of rides and drives, should their health permit, without passing into a different atmosphere. The absence of reflected heat renders it equally appropriate as a residence throughout the year."

*Geology.*—The following may be said to be the geological character of the surface of the country at Worthing: "From four to ten feet of loam; below this a stratum of sand and pebbles, from one to ten feet in thickness; and underneath this a layer of chalk and flints."

*Climatology.*—*Influence of the Sea on the Temperature.*—"I have never found the temperature of the water in the Channel to be higher than 70 degrees in the summer, or lower than 40 degrees in the winter."

"The site on which Worthing is built, from its projecting somewhat into the sea—being known to mariners as the Worthing Point—*must* have an equable climate."

"The tides recede nearly a quarter of a mile and give us some of the finest sands and sea-bathing in the kingdom."

"The influence of the tides also at this season of the year is as great as in the summer in commingling the two atmospheres and assimilating the one with the other, and if there be a



difference of ten or fifteen degrees, as is sometimes the case, between the atmosphere over the land and that over the water, this influence is very considerable. There is also another cause which has a most powerful effect at seaside places in maintaining the temperature at this season of the year. The atmosphere which comes from off the sea contains a large amount of aqueous vapour, which, as it approaches the colder air on the land, is condensed, giving out its latent heat, and contributing, towards evening and night, to the formation of clouds which shroud the earth, as it were, in a mantle, and prevent radiation from the earth's surface."

*Temperature.*—"The summer temperature is somewhat cooler at Worthing than at Ventnor and South Devon. The same slight difference also obtains in winter."

The mean daily range of temperature for the year as determined by Dr. Barker for 1858 was  $10.9^{\circ}$ ; at Ventnor it was  $9.5^{\circ}$ ; at Teignmouth  $12.6^{\circ}$ . In 1853 it was  $8.7^{\circ}$  at Worthing;  $9.8^{\circ}$  at Torquay.

*Humidity.*—"The moisture of the atmosphere is mainly derived from the ocean without any land impregnations. To this we owe *our complete immunity from intermittent fever.*"

The mean humidity during the year 1858 was 85 degrees at Worthing; 84 degrees at Ventnor and Osborne; 81 degrees at Teignmouth.

*Rainfall.*—In an average for six years Dr. Barker found 141 rainy days at Worthing (151 at Ventnor), a rainfall of 23.9 inches at Worthing (27.5 at Ventnor; and from 30 to 40 inches in Cornwall and Devon).

*Fogs and Mists.*—"Land-fogs do not occur, upon an average, three days in the year. During the heat of summer mists or sea-fogs prevail for a few hours two or three times." The atmosphere is remarkably translucent.

"The prevailing winds are from the south-west, west, and south. In summer the wind at 9 a.m. is east or east-north-east; as the day advances it becomes south-east, being converted from a hot, dry, and harsh wind to a soft and cool one."

*Comparative Climatology of Worthing and of Brighton.*—"It may be desirable to contrast the character of the climate of Brighton with that of Worthing, and to explain the causes of the great difference between two places so near to each other. The

air of Brighton may be considered as essentially keen and bracing, with considerable fluctuations in its temperature; whilst that of Worthing is soft, mild, and equable. The reasons of this difference are the following:—Brighton is situated in a bay, and Worthing on a point; the latter, therefore, is more exposed to marine influences. Brighton is, for the most part, on an elevated site—that is, *upon* the South Down Hills, whilst Worthing is *beneath* and to the *south* of these, and but a few feet above the level of the sea at high water. The soil of Brighton is principally composed of chalk, and therefore both heat and light are largely reflected. That of Worthing is a loam; the sun's rays, therefore, at the latter place, are to a large extent absorbed, to be again rendered up when these are absent. These several circumstances cause the air of Brighton to approximate in character to that of Scarborough, and Worthing to that of Torquay."

*Vegetation.*—"The forward state of vegetation is not owing to the warm summers—for they are usually very cool—but to the mild winters, the sheltered position beneath the hills, and the warm alluvial character of the soil; and to the same causes we owe the flourishing condition in the open air of many exotics. At West Tarring, about a mile and a half to the north-west of Worthing, the fig-tree grows most luxuriantly, and is very productive, and there are several whose age is estimated at one hundred and fifty years. The myrtle also flourishes remarkably well in the district—there is a tree in the same village growing in the open air upwards of sixty years old; and in some seasons this shrub has been seen flowering at Worthing after Christmas. The magnolia grandiflora also will generally continue to bloom during the early winter months; and there is a pomegranate tree in the centre of the town, planted about a quarter of a century ago, which produced in the year 1859 upwards of three hundred fruit as large as a small orange."

"The following are also frequently seen in blossom during the winter: the heliotrope, the violet, and mignonette; roses of various kinds; the *pirus japonica*, the lobelia, and valerian; cinerarias, verbenas, and daisies; the dandelion, the furze, and candytuft; primulas and daphnes; the hydrangea, the fuchsia, and wall-flower; the jessamine, and many others."

*Indications.*—"In whooping cough it is almost a specific. In chronic bronchitis and spasmodic asthma it is especially useful



in chronic rheumatism also, and in renal diseases. To invalids also, on their return from hot climates; and, lastly, to aged persons and children it is particularly appropriate."

"I cannot forbear to notice the small mortality amongst children."

In 1860 the mortality registered in Worthing was 16·1 per 1,000.

" 1861	"	"	"	18·1	"
" 1862	"	"	"	12·0	"
" 1863	"	"	"	15·2	"
" 1864	"	"	"	12·1	"
" 1865	"	"	"	15·0	"
" 1866	"	"	"	13·0	"

7)101·5

Average ... .. 14·5

### *Meteorological Tables.*

In connection with Barker's parallel between the climate of Worthing and that of Brighton, the following meteorological records for ten years, 1881-1890, drawn up conjointly with those from Brighton, will prove of service. They are extracted from a Paper in the *Meteorological Society's Transactions*, 1894: "English Climatology, 1881-1890." By Francis Campbell Bayard, F. R. Met. Soc.

	STATION.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
Mean Temperature/ at 9 a.m. ... ..	Brighton .	39·6	40·0	41·6	47·1	55·7	60·2	63·0	63·4	59·4	51·8	46·2	40·2	50·7
	Worthing .	38·8	39·6	41·3	47·0	54·4	59·4	62·2	62·3	58·9	50·8	45·7	39·5	50·0
Mean Minimum/ Temperature ...	Brighton .	35·0	36·0	35·6	40·3	46·4	51·6	55·1	54·8	52·3	44·7	42·2	36·2	44·2
	Worthing .	34·5	35·6	35·3	39·8	45·9	50·9	54·2	53·9	51·6	44·0	40·8	35·2	43·5
Mean Maximum/ Temperature ...	Brighton .	44·8	44·9	47·6	52·3	60·4	65·4	67·9	66·9	64·0	56·8	51·8	45·8	55·7
	Worthing .	43·5	44·4	47·3	52·6	59·5	64·6	67·0	67·4	64·6	56·4	50·3	44·0	55·1
Mean Temperature	Brighton .	39·9	40·5	41·6	46·3	53·3	58·5	61·5	60·9	58·1	50·8	47·0	41·0	50·0
	Worthing .	39·0	40·0	41·3	46·2	52·8	57·7	60·6	60·7	58·1	50·1	45·6	39·6	49·3
Mean Relative Hu- midity at 9 a.m. ...	Brighton .	87	85	82	74	71	74	77	70	80	80	86	85	80
	Worthing .	90	89	84	80	76	76	78	77	82	85	90	90	83
Mean Amount of Cloud at 9 a.m. ...	Brighton .	...	...	...	...	...	...	...	...	...	...	...	...	...
	Worthing .	6·6	6·4	5·8	5·9	5·5	5·7	6·1	5·2	5·4	5·5	6·6	6·4	5·9
Mean Rainfall ...	Brighton .	2·67	2·04	1·92	1·70	1·76	1·70	2·60	2·12	2·70	3·74	3·37	2·43	28·75
	Worthing .	2·30	1·92	1·76	1·55	1·74	1·69	2·32	1·99	2·50	3·29	3·32	2·26	26·64
No. of Rainy Days/ (0·01 in. upwards)	Brighton .	16	13	13	12	11	10	12	12	12	10	17	15	153
	Worthing .	16	13	11	12	11	11	12	12	13	14	17	15	157

Tables have also been prepared for the Report to the Royal Medical and Chirurgical Society.

## WORTHING.

## I.

MONTHLY MEANS FOR TEN YEARS (1880—1889), OR AS MUCH OF THAT PERIOD AS COULD BE OBTAINED.  
*Specially drawn up for the Report to the Royal Medical and Chirurgical Society.*

Month.	TEMPERATURE OF AIR IN MONTH.							Mean Pressure of Atmosphere in Month. (9 a.m. and 9 p.m.)	WIND. (9 a.m. and 9 p.m.)				Mean Cloud. (9 a.m.)	RAIN.				
	Highest.	Lowest.	Range.	Mean of Highest.	Mean of Lowest.	Mean Daily Range.	Mean Temperature of Air in Month.		Mean Relative Humidity. (9 a.m.) %	Mean Maximum in Sun.	Amount of Sunshine.	Calm.		N.	E.	S.	W.	Days it fell.
January ...	52.2	13.5	38.7	42.6	33.8	8.8	°	°	°	38.2	90					7.6	14	2.09
February ...	56.2	20.2	36.0	44.7	35.8	8.9	°	°	°	40.2	89					6.6	14	2.07
March .....	62.3	22.9	39.4	47.7	35.7	12.0	°	°	°	41.7	84					5.7	11	1.74
April .....	68.5	28.3	40.2	52.7	40.0	12.7	°	°	°	46.3	80					5.8	12	1.49
May .....	75.0	33.1	41.9	59.4	45.7	13.7	°	°	°	52.6	75					5.5	11	1.64
June .....	81.5	38.7	42.8	64.7	51.0	13.7	°	°	°	57.9	76					5.7	10	1.61
July .....	82.0	40.0	42.0	67.2	54.6	12.6	°	°	°	60.9	78					5.9	13	2.34
August .....	83.3	43.4	39.9	68.0	54.4	13.6	°	°	°	61.2	76					5.5	11	1.95
September .	78.7	33.6	45.1	64.6	51.8	12.8	°	°	°	58.2	82					5.6	13	2.84
October .....	68.7	28.2	40.5	56.2	44.0	12.2	°	°	°	50.1	84					5.6	15	3.80
November .	59.1	27.0	32.1	50.3	41.0	9.3	°	°	°	45.6	89					6.6	16	3.35
December .	54.9	23.2	31.7	45.3	36.5	8.8	°	°	°	40.9	90					6.4	17	2.63



## WORTHING.

## II.

QUARTERLY AND YEARLY MEANS FOR TEN YEARS (1880-1889), OR AS MUCH OF THAT PERIOD AS COULD BE OBTAINED.

*Specially drawn up for the Report to the Royal Medical and Chirurgical Society.*

Quarters and Year.	Mean Pressure of Atmosphere. (9 a.m. and 9 p.m.)	Temperature of Air.						Mean Relative Humidity. (9 a.m.)	Mean Maxima in Rain.	Amount of Sunshine.	Wind. (9 a.m. and 9 p.m.)				Mean Ozone.	Mean Cloud. (9 a.m.)	Rain.	
		Highest.	Lowest.	Range.	Mean of Highest.	Mean of Lowest.	Mean Daily Range.				Calm.	N.	E.	S.			W.	Days in Fall.
Jan.—March .		62.3	13.5	48.8	45.0	35.1	9.9	88							6.6	39	5.90	
April—June ..		81.5	28.3	53.2	58.9	45.6	13.3	77							5.7	33	4.74	
July—Sept. ..		83.3	33.6	49.7	66.6	53.6	13.0	79							5.7	37	7.13	
Oct.—Dec. ...		68.7	23.2	45.5	50.6	40.5	10.1	88							6.2	48	9.78	
Whole Year...		83.3	13.5	69.8	55.3	43.7	11.6	83							6.1	157	27.55	

LITTLEHAMPTON AND BOGNOR, AND THEIR DISTRICT.<sup>1</sup>

The maritime plain which stretches between the South Downs and the coast in the western part of Sussex, broadening towards the west, is a warm, sheltered and fertile area. The chalk is covered, according to Dr. Kelly (quoted in Shirley Murphy's book), to a depth of fifteen to fifty feet with loam and brickearth—the soil being of a moderately pervious type.

The plain is varied with a few clumps of trees, but is mainly occupied by farmlands where agriculture is conducted with success. Relative dryness is a peculiarity of the soil as well as of the air. The watercourses are very weak and rapidly dry in a drought.

The rainfall of Bognor and at Littlehampton is much less than in neighbouring districts, and is as small as that of many places, such as Brighton, situated farther east.

Shelter from the north and north-east winds is given by the Downs, which present seawards a gentle slope, and in many parts are covered with a heavy tree growth.

## BOGNOR.

Dr. Symes Thompson writes :—" Bognor was a fashionable place half a century ago. The local gentry have scattered and their good houses are mixed with half-finished villas and open spaces in the midst of the town, giving it a forlorn appearance. The sands are rather wet and clayey. Hence they are unusually tenacious, and allow castles and even 'sandmen' to be erected by the busy spades of the children."

The town extends with a gentle slope down to the beach. The beach is very extensive, miles of sands being exposed at low tide. There is a small margin of shingle, but no mud. The water is very chalky, with abundant chlorides. The drainage is by the water-carriage system with outfall east and west of the town.

Bognor is supposed to be very healthy. It is an excellent resort for children, provided they suffer from no tendency to ague. At present there is no winter season.

<sup>1</sup> No response has, unfortunately, been made from Bognor or Littlehampton to the Reporter's repeated applications for information, and for replies to the Royal Medical and Chirurgical Society's circular.



## LITTLEHAMPTON.

Dr. Symes Thompson writes:—"Littlehampton has a broad extent of grass between the houses and the Esplanade, affording an unusually pleasant playground for children. The flat land extending to Arundel and the Downs further north used to be aguish, and to the present day malarial symptoms are met with among the residents in this flat land and in the lower parts of Arundel." This circumstance partly explains the otherwise undeserved neglect into which both towns have fallen.

## THE CLIMATE OF KENT.

By WILLIAM EWART, M.D., F.R.C.P.

KENT, with an area of 1,041,479 acres, occupies the whole south-eastern corner of England, east of a line drawn from London to Rye. It forms the south bank of the Thames from London to the sea, and is bathed by the North Sea on its northern, eastern, and southern aspects.

The northern boundary is supplied by the Thames from its mouth to Crossness; and by the North Sea from Shellness Point in Sheppey to the North Foreland. The North Sea forms the eastern boundary from the North Foreland to the South Foreland. The southern coast of Kent runs from the South Foreland to a point east of Rye and west of Dungeness. The western boundary drops from Crossness, between Plumstead and Erith Marshes, southwards to East Wickham. It consists of two sections. That from Deptford to Bearden runs nearly due south. That from Bearden to the sea has a somewhat sinuous direction south by south-east.

**General Survey and Geological Features of Kent.**—The most important geological features are the wealden series, and the broad tract of chalk which runs through the entire county from West Wickham to Dover and north of which are arranged in parallel but somewhat discontinuous order (1) the alluvial deposits of the Thames extending southwards up the Medway at Rochester; and the alluvial deposit of the Stour, extending nearly up to Canterbury, and partly surrounding the Isle of Thanet; (2) the zone of London clay which extends in somewhat broken series in contact, and sometimes alternating, with the alluvium as far as Pegwell Bay and Sandwich; (3) the similarly broken line of Woolwich and



Oldhaven beds, which runs in the midst of the clay, more particularly near its southern limit.

*The Chalk Deposit.*—The chalk approaches the Thames at Greenwich, and touches it at Erith and at Gravesend for short stretches, but does not again form part of the northern boundary of Kent until Thanet is reached. It faces the sea from Deal to Folkestone towards the east; and its southern limit is the Weald.

*The Wealden Zones.*—Here again the deposits occur in parallel order from north to south, viz. (1) a belt of upper greensand and gault, and a belt of (2) lower greensand, which terminate respectively at Folkestone and Hythe; (3) the wealden clay, and (4) the Hastings sands—which are both separated from the sea by the alluvial deposit of Romney Marsh; whereas, in Sussex, the Hastings sands extend into the sea west of Rye.

It is thus seen that the recovery of the chalk south of the denuded area of the weald does not occur within the boundaries of Kent. Indeed, the South Downs which are formed by the elevation of the chalk in the south are entirely confined to Hampshire and Sussex, and terminate at Eastbourne.

For the purposes of description a distinction may be made between the coast line, the inland districts, and the Weald of Kent.

**The Weald of Kent.**—The Kentish Weald is a partly wooded area which was formerly covered with forest, but now for the most part cultivated. It is limited by the North Downs and by the Mid-Kent range.

South of Rochester the line of the North Downs, steadily pursued from west to east as far as this point, forms an angle with the south-easterly direction of the range which supplies the eastern boundary of the Weald and extends to Charing, the same direction being followed by the Folkestone range. The Mid-Kent hills resemble the North Downs in their steep declivity towards the Weald, but they do not attain the same expanse nor the same elevation. The upper portion of the Weald is drained by the Lenham source of the Stour, the remainder by the streams running towards Maidstone to form the Medway.

Internal to the double system of encircling hills which we have described, stretches the relatively vast expanse of the Weald made up of the central region of the Hastings sand and

of a broad belt of arable, framed in by the narrower zone of the greensand series, which extends from Westerham to Folkestone. The Weald thus occupies the smaller south-westerly half of Kent, and is continued into the Weald of Sussex.

To any one looking south on a fine day from any prominent point on the edge of the Surrey Hills the eye ranges over an apparently wide plain which separates the observer from the Sussex Downs, whose outlines and features are plainly distinguishable some thirty miles off. To the east this plain extends over the central portions and indeed over the greater part of Kent, draining into a meshwork of streams which form the tributaries of the Medway and of the Stour. A large part of this country, that occupying the south-west, is called the Weald of Kent and is fairly typical of the whole. It is difficult to describe so extensive an area, from a climatological standpoint, in general terms. It is generally undulating, in places hilly, presenting variations of soil and aspect, foliage and water, which of course influence the climate in their respective ways. You may pick out hills of gravel or sand or chalk and find on them favourable sites protected by accidents of surface or by trees. But as a rule the whole district is inclined to be flat, a great proportion of the ground is low lying stiff clay, and throughout the district an invalid in selecting a residence ought to be specially on his guard against dampness of soil and imperfect surface drainage.

The characters of the district can be well studied from the window of a railway carriage by a traveller on the South Eastern Railway, between Ashford and Tonbridge. The railway has about a quarter of the Weald on its right, extending from Ashford to Edenbridge, the remainder being towards the Sussex boundary, and extending from Edenbridge, through Groombridge, Tunbridge Wells, Lamberhurst, Bodiham, and along the river Rother, as far as the sea coast at Rye, on the borders of the Romney Marsh.

#### THE INLAND DISTRICTS MORE IN DETAIL.

**I. North Kent between the Chalk Hills, the Thames, the Darent, and the Surrey Border.**—The southern boundary of this district, between Tatsfield and Otford, is supplied by the heights of Brasted (812 feet), Chevening (783 feet) and Knock-



holt. The broad valley between this range and that of Kemsing accommodates two parallel railway lines, one on either side of the Darent.

The bank of the river Thames is formed by alluvium, chalk making its appearance only for a few hundred yards at Erith and Greenwich.

The greater part of the district, viz. as far east as Erith and as far south as West Wickham and Farnborough, is a continuation of the London clay supplemented south of Greenwich and of Woolwich by an extensive deposit of Woolwich beds. An isolated deposit of the same kind also occurs north of Halstead.

The northern boundary of the chalk district is curved between West Wickham, Keston, Farnborough and Orpington (all on chalk), but farther east it is very irregular, the main boundary passing from Orpington to Farningham. A strip of chalk extends northwards through St. Mary's Cray, St. Paul's Cray, Foot's Cray and North Cray. The Woolwich beds deposit approach the Darent at Dartford, Wilmington and Sutton at Hone. Nevertheless chalk occupies the bank, and the chalk area quickly broadens out towards the south, where it is unmixed.

The general elevation of the district is good. It reaches upwards of 300 feet at Chislehurst, and farther south, near Farnborough and Halstead, 515 and 616 feet respectively, thence rising on to the hills.

The southern section, being chalky and high, has no water-courses, but the northern section is drained by the Ravensbourne and its tributary the Lee, and by the Cray.

The chalk area, especially in its higher portion, is singularly bracing.

**II. North Kent between the Darent and the Medway.**  
—With the exception of isolated patches of Woolwich beds and London clay, this section has a chalky subsoil, which would extend continuously along the river's edge, but for the alluvial deposits at the mouth of the Darent, east of Greenhithe, and east of Greenwich.

Dartford is on chalk, but partly also on the alluvial deposit. Darenth and South Darenth are on the edge of the detachment of Woolwich beds and clay which extends to near Southfleet. A smaller detachment occurs immediately south of Northfleet and

Gravesend. Similar deposits also cover the greater part of the area between Stroud and Munsted, including Shonn and Gad's Hill.

The range of chalk hills which forms the southern boundary, whilst preserving a straight line between Kemsing, Wrotham, and Trotterscliffe, with an altitude upwards of 700 feet, extends northwards at either end, like the horns of a crescent, by the side of the Darent and of the Medway respectively. A railway line in both cases occupies the interval between hill and river. Eynesford, which is close to the termination of one of these spurs, Farningham, and Horton Kirby are all on the Darent; Cuxton on the Medway marks the end of the other spur, Upper Halling occupying its declivity.

The whole district lies high, and like others of similar geological constitution enjoys a dry and bracing air.

There are no rivers except those forming the lateral boundaries of this area, and these do not receive any tributaries from the latter.

### III. North Kent between Chatham and Faversham.—

The range of chalk hills between Rochester and Charing, of which Hollingbourn Hill (606 feet) forms the centre, is the boundary of this district to the south-west, the Blean river to the east, and the Medway and the Swale to the north.

The greater part of the district, with the exception of a belt of uneven thickness extending along the Medway and the Swale, has a chalky subsoil. Rochester and Chatham are also on chalk, the alluvium being here interrupted as it is at Greenwich, Erith, and Gravesend. A narrow strand of alluvium (Wouldham) accompanies the Medway as far as Aylesford.

Sittingbourne, Milton, Bapchild and Boughton are on Woolwich beds or clay; but Faversham, Ospringe, and Norton are on chalk areas, which project between the serrations of the belt of clay and Woolwich beds. An isolated patch of Woolwich sands and clay occurs between Selling and Badlesmere.

The chalky upland resembles in its meteorological peculiarities that of the other parts of Kent. Very few watercourses are to be seen. The air is bracing as well as dry, but too cold and harsh in winter for invalids.

### IV. East Kent, beyond the Folkestone Range of Chalk Hills, and East of Faversham.—

The description of this



extremity of Kent, which is surrounded by the sea on three sides, will necessitate further subdivision into: (*a*) The north coast; (*b*) Thanet; (*c*) The east coast; (*d*) The south coast;—all of which will be dealt with in special sections; and lastly (*e*), the only remaining area, that of which Canterbury forms the centre. This we will proceed to describe.

**V. Canterbury and the Canterbury Plain.**—Although partly built on chalk, and surrounded by chalk hills, Canterbury is flanked east and west by large tracts of clay, which rise above the level of the valley of the Stour. Probably owing to this circumstance, and to its low lying position in the river valley, the town has a relaxing climate, whilst that of the surrounding country is cold, but healthy. Although Canterbury cannot be regarded as a health resort, the following notes contributed by Mr. Pugin Thornton will be read with interest. "The town is celebrated for the longevity of a large number of its inhabitants. The water for the public supply is second to none, and has only one or perhaps two compeers in England. It is obtained from the chalk at a depth of 500 feet. It contains 16 grains of carbonate of lime; this is softened and reduced by the Clark's process to 4 grains before the water is pumped up to St. Thomas' Hill (230 feet high). It is delivered in constant supply with a pressure of 60 lbs. to the inch, sufficient, in case of fire, to carry it to the roof of the world-known Canterbury Cathedral, which is 100 feet high."

Between Canterbury and the Kentish north coast the country is but slightly hilly, and this character extends along the left bank of the Stour as far as Thanet. To the north and north-west, dividing Canterbury from Faversham, we notice thickly wooded chalk hills. This district, known as the Blean Woods, was formerly the property of the Chapter of Canterbury.

Northwards, towards Whitstable and Herne Bay, and eastwards, towards Sandwich, all is clay; and the northerly and easterly breezes are equally unopposed.

To the east of Canterbury are level open plains, stretching to the mouth of the River Stour, with grassland and rich pastures, and becoming marshy near the sea. They are swept by the winds from the north and from the east, and must be described as bleak and ungenial.

The following particulars are from the pen of Mr. Pugin Thorn-

ton of Canterbury. "The Stour arises from one head at Lenham (midway between Maidstone and Ashford), and from another at Postling (four miles north of Hythe, and midway between Ashford and Folkestone). This latter source is joined west of Sellindge by a stream from Stowting. These two sources of the Stour, the Lenham one after draining the upper portion of the Weald of Kent, join at Ashford, and form the river which passes through the villages of Wye, Chilham, and Chartham, between the chalk hills as far as Canterbury. The Stour from Wye is well-preserved for trout. After passing through Canterbury by two branches, it again becomes one stream running past the village of Sturry, and the town and part of Fordwich (a limb of the Cinque Port of Sandwich), where formerly a weir was kept and the Fordwich trout caught by the Mayor and Corporation of this now defunct borough. The Fordwich trout, which has been caught over 20 lbs. in weight, is thought by some, amongst whom was the late Mr. Frank Buckland, to be a Bull trout (*Salmo eriox*); by others that it is a Sea trout (*Salmo trutta*). Below Fordwich the marsh land described above begins."

"The Lesser Stour first commences three miles from Canterbury in Bourne Park, Bridge, but for the most part is fed by springs, a mile lower down, in the Garrington Meadows above (S. W. of) Littlebourne. It passes through Ickham and Wickham, and joins the Stour at Pluck's Gutter below Grove Ferry (a station on the South Eastern Railway). An occasional tributary to the Lesser Stour at its commencement is the interesting stream known as the Nailbourn, or Eylebourn. It runs for periods of a few months usually about every five or six years, though occasionally it may have only a year's intermission. This year (January, 1895) it has made its re-appearance after an interval of two years. It rises at the bottom of Etching Hill, which is between the Shorncliffe Camp and Lyminge, and passing through this village and those of Elham, Barham (of Ingoldsby Legends fame), and Bishopsbourne, it runs above the adjoining village Bridge into the Lesser Stour. This Nailbourn at its height is many feet wide and four or five feet deep. A reasonable explanation of this curious phenomenon is the existence of some natural reservoir emptying itself, after the manner of a tank, by syphon action. The effect of the Nailbourn of 1893, which lasted nine months, on the grass crop was extraordinary.



Although on account of the drought during the spring and summer the amount of hay carried from many fields was far below the usual crop—in fact a large number of farmers in Kent never attempted to cut their grass, because they had none to cut—yet along the banks of the Nailbourn the growth of grass was enormous. In Bishopsbourne some fields for a hundred yards on each side of the stream gave over two tons of hay to an acre, one ton being considered a very good crop. Unfortunately this hay was coarse.”

The Lesser Stour, which runs a northerly course from its origin as far as Grove Ferry, divides the chalk area into two portions, both of moderate elevation, and both almost destitute of irrigation. Stone Street lies nearly halfway between the Great and the Little Stour, and this interval also presents several parks and woods. On each side of the road from Canterbury to Dover fine country residences and beautiful parks abound.

The geology north of Canterbury is that of a clay district. The alluvial deposit extends up the Stour and the Lesser Stour valleys, as far as Ashford and Bridge respectively; and the border between the chalk and the clay chiefly consists of Woolwich sands. The clay district is to a great extent wooded (Thornden, Clowes Hoath, Blean Woods, &c.). It is partly drained by short streams into the sea, slightly also into the Stour.

Immediately south and east of Canterbury the ground is generally high. Chartham Down<sup>1</sup> is the upland of this region and affords a view over a great part of the district. At a greater distance south of Canterbury chalk extends uninterruptedly as far as the greensand between Charing and Folkestone, and as far as the coast between Folkestone and Deal. Its level rises gradually towards the cliffs; but, over the greater extent, the surface is of considerable elevation, exposed and bleak.

*The Climate of East Kent.*—The climate of East Kent varies with the elevation and the soil. The air over the chalky upland is bracing and dry, but owing to the neighbourhood of three sea-boards, less bracing and less dry than the air of the North Downs.

The valley of the Stour is relaxing.

The clay district north of Canterbury is cold and even harsh in winter, and much exposed to east winds as well as to those from the north.

<sup>1</sup> Also Barnham Downs where there is a well defined site of a Roman encampment.

It may be stated in general terms that, with the exception of the coast line (Herne Bay, Folkestone, Margate, Ramsgate, &c.), the climate of East Kent presents none of the virtues which are looked for in winter resorts for invalids, although it is the home of a hardy race.

**VI. The Folkestone Upland District.**—(By Dr. R. L. Bowles, F.R.C.P., &c.)—"The chalk hills between Folkestone and Dover to the north and north-east, begin at the cliffs above the Warren,<sup>1</sup> and, traversing Kent in a westerly direction, are intersected by small valleys running north and south. The Folkestone range extends as far as Wye. The plateau at the top ranges about five hundred feet above the sea level, and, being about the highest land in Kent, is swept by all the winds of heaven; but here, as elsewhere, on the coast of Britain, the prevailing south-west wind obtains the mastery, as evidenced by the lean and shape of the trees."

"Between the edge of the cliffs and Etching Hill, about five miles to the west, the soil is mostly of a light clay laden with flints on the surface of the chalk, and the climate of this district is necessarily from its position cold, bleak, and often in cloud, when the plateau on which Folkestone stands is in bright sunshine. In this district there are many gentlemen's parks, beautifully wooded with beech, elms, and other forest trees which afford some protection; but the intervening land has not been found suitable for the growth of hops."

"At the foot of Etching Hill,<sup>2</sup> about two hundred or two hundred and fifty feet lower down, is another slightly undulating, beautifully wooded and fertile plateau running south-west to Lympne, which is situated at the top of an abrupt descent on the edge of Romney Marsh. The view from Lympne is only bounded in the distance by Fairlight Hill near Hastings."

<sup>1</sup> The Warren, or Little Switzerland, as it is locally called, is broken, undulating, and exceedingly picturesque ground at the foot of the chalk cliffs, along and through which the South Eastern Railway runs, between East Wear Bay and Shakespeare's Cliff.

<sup>2</sup> "Etching Hill, near the Shorncliffe Camp, forms the division of the watershed. The streams on its southern side, running a distance of about two miles, empty into the sea; those on the south-western form the second head, as already mentioned, on the Stour; and on the south-eastern side is formed the Nailbourn, the occasional stream running through Lyminge, &c., into the Lesser Stour." (W. Pugin Thornton.)



"Relatively, Lympne is considerably higher than the Marsh, and, being fully exposed to the violence of the south and west winds, is somewhat bare of wood. With the exception of a streak of blue clay which crops out at the foot of the chalk hills, the soil is dry and sandy."

"As the ague died out of the Marsh from improved drainage and other conditions, mild and indefinite forms of this disease constantly lingered about Lympne and the elevated regions in that neighbourhood; this was especially the case after spells of still weather, when neuralgias also continued to prevail."

*Springs from Chalk.*—"At the foot of the chalk hills where the blue clay crops out in its whole length from Folkestone to Wye, numerous chalk springs appear, those at the Cherry Gardens contributing to the Folkestone water supply, the overflow of which forms the Pent stream, which empties itself into the Folkestone harbour, from Newington and Beachborough, then from a stream flowing into the sea at Seabrook."

*Landslips.*—"In the Warren, on the Folkestone foreshore, at Sandgate, Hythe, Lympne, and below the high land bordering the Marsh, the land is singularly broken, irregular, and lumpy, and covered, especially in the Warren, with wild and most luxuriant scrub and vegetation."

"This rough ground is the frequent seat of landslips, sometimes of a most serious character. I have seen many during my life at Folkestone. They depend upon the fact that the chalk and greensand rest upon beds of clay which slope towards the sea. After long continued wet weather, the rain penetrates to the surface of the clay, and then works its way beneath the sand towards the sea, carrying with it continually a proportion of sand, and so undermining large tracts of land. I have constantly observed these springs laden with sand bubbling up at the foot of the cliffs. Many unseen springs are known to rise in the bed of the sea itself. Doubtless the late disastrous landslip at Sandgate was due to these causes."

**VII. The Rye and Romney District.**<sup>1</sup>—Two sides (east and south) of this quadrilateral district are bathed by the sea. The western boundary is an artificial one, viz., the section between Wye and Rye of the railway line connecting Ramsgate, Canterbury, and Hastings. But the north-eastern boundary is natural; it is the

<sup>1</sup> Also partly contributed by Dr. R. L. Bowles, F.R.C.P., &c.

same as that of the weald and consists of a range of chalk hills continued inland from the Dover and Folkestone cliffs, from Coldham past Newington, Postling, Monk's Horton, Brabourne, to Spider's Castle near Wye.

The geology of this district is a repetition of that of the other sections of the weald and as typical as any of them, except that the Hastings sands do not form part of it, but that it presents instead an extensive alluvial plain known as the Romney Marsh, bounded to the north by the Grand Military Canal between Hythe and the Rother, and which is elsewhere described.

At the foot of the hills, which have been mentioned, gault takes almost entirely the place of the upper greensand and forms a narrow band which broadens out to the width of two and a half miles between Wye and Hinxhill. It is at this level and at Ashford that the lower greensand presents least width; the zone gradually increases in extent down to the sea and the Grand Military Canal, where it forms a broad foot seven to eight miles in length between Sandgate and Aldington. A narrow line of clay is interposed between this deposit and the Grand Military Canal between Aldington and Hythe. This is a continuation of the wealden clay, of which a triangular piece contains New Town, Ham Street, Ruckinge, Bilsington and Bonnington.

The clay is bounded off by a typically developed secondary range of hills in the lower greensand. This is continued inland from the Folkestone cliffs, which gradually retire from the sea-coast at Sandgate and acquire greater height as they pass north of Hythe and West Hythe to Lympe and Ellen Cole, where the range stops somewhat abruptly.

From Lympe a fine view extends over the green flats of the Romney Marsh and the sea, and to the north to the chalk hills across the high sandy valley of Merstham, Sellindge, Stanford, and Saltwood. This valley is drained by the southern (Postling) branch of the Stour, and its numerous small tributaries, some of which, having their origin at no great distance from the sea, yet take their course away from it.

The climatic faults and merits of this district are indicated by its geology and configuration. The Romney Marsh has the disadvantage of an extremely low level, in parts below that of the high tides, and of somewhat stagnant watercourses, an evil which has



been partly mitigated by the extensive artificial drainage carried out by the inhabitants.

Hythe and West Hythe share in these drawbacks, but their subsoil is partly sand. They enjoy entire protection from the north wind.

Sandgate is on higher ground and entirely on sand. It also enjoys almost complete protection from the north. The part of Folkestone on the East Cliff is built on the belt of gault previously described; but the West Cliff, the more modern and better part of the town, is on sandy soil and lies high. Although Folkestone is under the immediate protection of the chalk hills on the north, still it lies at the extremity of an elevated plateau, leaving it somewhat open to the north-west. This helps to give it a bracing character different from that of Sandgate. The high sandy valley (lower greensand) from Ashford to Sandgate presents the advantages of climate in association with those of natural attractions. It is well covered with villages and family residences, and has doubtless been found healthy.

#### VIII. **The Maidstone, Charing, and Cranbrook District.**

—The chalk hills between Rochester and Charing form the north-eastern boundary; the Medway and the Tiese the western boundary. Between Wye and Ashford the south-eastern boundary is traced by the Stour and by the railway line to Rye, but beyond Ashford by the railway line only. The Sussex border extends from Lamberhurst, near Goudhurst, to the sea, following the course of the Rother.

The conformation of this part of the Kentish Weald resembles that of other portions, but the chalk hills suffer a long gap between Charing and Wye, Eastwell Park occupying part of the interval. Here again the secondary rise of the lower greensand is not conspicuous, and can be rather inferred from the course taken by the small tributaries of the parallel rivers, the Stour and the Beult, than seen as a definite range of hills. The northern branch of the Stour, which joins the southern branch at Ashford, continues the direction of the latter in the belt of upper greensand.

Debtling and Thornham, near which the chalk hills have an elevation of 657 feet, Broad Street, Hollingbourn, Harrietsham, and Lenham, all lie in the narrow belt of upper greensand and gault at the foot of the hills.

The belt of lower greensand, which is narrow at Hothfield near Ashford, broadens north of Ulcombe and acquires its greatest width on the banks of the Medway, between Aylesford, Maidstone, and Yalding. Hunton, Sutton Valence, Ulcombe, and Egerton mark the northern boundary of the wealden clay; Marden Frittenden, Biddedden and Wood Church, its boundary to the south.

The remaining portion containing Goudhurst, Lamberhurst, Cranbrook, Benenden, Tenterden, Rolvenden, Newenden, Stone and Appledore, belongs to the Hastings sand deposit. But part of the Oxney Isle, with Wittersham, has an alluvial subsoil continued from that of the Romney Marsh.

Reference has already been made to the absence of high hills in the zone of greensand. Goudhurst, near Cranbrook, is really the only important elevation (418 feet) in the district. It is isolated by a slight interval from the central range of hills of the Hastings sands in Sussex.

This district, which contains the central part of Kent, is drained in various directions, towards the north into the Tiese, the Beult, and the Medway, towards the east into the Stour, and towards the south into the Rother. If lacking some of the picturesque charm of the neighbouring district it has the advantage of fertility, especially in the central zone of clay. The predominance of a sandy subsoil and a moderate elevation render it salubrious, and an eligible residence in summer and autumn, but there is less protection against the north and east winds of winter and spring than is needed for invalids.

Maidstone is not close enough to the chalk hills to be fully protected from the north-east, and cold draughts from the north gain access to it up the Medway.

Ashford, except during the warm months, is bleak. It is deprived of protection by the long gap in the chalk hills between Charing and Wye; and along the valley of the Stour it receives some of the strength of the north-east as well as of the south-west wind. In other respects, and especially since the improvement in its drainage, it is healthy.

**IX. The Sevenoaks, Tunbridge Wells, and Goudhurst District.**—The chalk hills to the north, the Medway and Tiese to the east, the Tiese and Sussex border to the south, and the railway line to Eastbourne on the west define this section of the



Weald. The narrow belt of upper greensand and gault presents the villages of Otford, Kemsing, Wrotham, and Trotterscliffe, all at the foot of the chalk hills.

The limits of the lower greensand to the south are determined by a short range of hills extending south of Knowle Park and as far as Plaxtole, in a line with, although at a distance from, Crockham Hill. Ightham, Offham, Addington, Leybourn, East and West Malling, Watlington, &c., are situated in this zone.

The belt of wealden clay has its central point at Hadlow, and its southern limit at the entrance into Tunbridge, which is built on the Hastings sand.

The area between Tunbridge, Pearson's Green, near Paddock Wood station, and Sussex is sandy (Hastings sands). Lamberhurst, Horsemonden, Brenchley, and Pembury occur in this area, besides Tunbridge Wells. The whole district is drained by the Tun, the Medway, and the Tiese.

**X. The Westerham and Tunbridge Wells District.**—The chalk hills ranging from 700 to 800 feet which bound this district on the north are those of Chevening and Knockholt (at the foot of which lie Brasted and Chipsted) interrupted in the east by the valley of the Darent between Kemsing and Otford. Riverhead and Sevenoaks lie south of this gap; but the Darent takes a turn to the east parallel to the range of hills.

The secondary range of hills belonging to the lower greensand are well represented by Crockham Hill (709 feet) to the west, and by the Panthurst range, intervening between Sevenoaks and the Sevenoaks weald to the east.

Between the two ranges the slender belt of upper greensand and of gault (Brasted, Chipsted, Chevening, Dunton Green), and the broader belt of lower greensand (Sevenoaks, Riverhead, Sundridge, Westerham, &c.), occupy a third of the distance from the hills to the Sussex border.

The Surrey border and the railway line to Eastbourne (passing through Riverhead, Sevenoaks, Tunbridge, and Tunbridge Wells) define the limits of the district on either side. Clay occupies the smaller half of the remaining area. Edenbridge is the only place of importance in this district.

Hastings sands underlie the whole area south of Edenbridge and Hildenborough (Hever, Chiddingstone, Leigh, Tunbridge, Pens-

hurst, Bidborough, Crittenden, Bearden, Cowden, Speldhurst, Ashurst, Tunbridge Wells).

The clay and the Hastings sands are freely drained by the Medway, which flows through Tunbridge Wells and Tunbridge, after receiving tributaries also from the lower greensand between Crockham Hill and Panthurst. The greensand valley is, however, mainly drained by the Darent. With the exception of the clay area occupied only by farms and hamlets, the whole district is picturesque as well as healthy, and abounds in parks and residences. The view from Crockham Hill and the scenery about Tunbridge Wells are noteworthy.

**XI. The Isle of Sheppey.**—The upland of Sheppey possesses climatic features of interest, and, it would appear from Mr. Julius Cæsar's report, also a well-deserved reputation in connection with the treatment of phthisis. It is noteworthy that Sir George Buchanan, when investigating the local distribution of phthisis in the south-eastern counties, placed Sheppey at the head of the list as least visited by the disease.

#### THE KENTISH COAST MORE IN DETAIL.

**(A) The North Kentish Coast Line, including the South Bank of the Thames.**—*From Erith to Gravesend*, both being included, the Kentish chalk, which had made an isolated appearance at Greenwich, extends to the river's edge, but it is interrupted east of Erith for a distance of three miles by the alluvium at the mouth of the Darent, which also extends some way up that river. A little farther, at Greenhithe, alluvium again appears.

*From Gravesend to Rochester* the line of chalk leaves the river side, and takes a short course across the isthmus between Gravesend and Stroud, with interruptions by offshoots from the Woolwich and Oldhaven beds, west of the Medway. The latter deposit forms a great part of the peninsula which intervenes between the Thames and the mouth of the Medway, and which terminates with the Island of Grain, opposite Sheerness. Its northern side is all alluvium, as well as the greater part of the southern. But at Hoo, facing Gillingham and Chatham, London clay forms the bank. There is no place of any size or interest in this district, which the Thames and Medway canal convert into an island.



Allhallows and High Halstow are both built on the clay, a patch of which also occurs in the Isle of Grain. North-west of High Halstow chalk occupies the surface over an area of two and a half by one and a half miles.

*From Rochester to Faversham.*—The small islands which occupy the mouth of the Medway are all alluvial. Alluvium also supplies the banks of the Medway inland as far as Aylesford, interrupting the chalk and the upper and lower greensand.

*The Swale and the Isle of Sheppey.*—Faversham Creek faces the eastern extremity of the Isle of Sheppey and Harty Isle, across the broadening eastern part of the Swale. Both banks of the Swale are lined by a thick belt of alluvium, which also includes the east point of Sheppey. The north-west point of Sheppey at the mouth of the Medway, facing the Isle of Grain, also forms an isolated alluvial deposit, upon which Sheerness is built; but one mile south of the latter, Queenborough, which also faces west, but at the same time slightly south, is built on a short waterside range of clay. The same clay deposit stretches across the entire northern half of Sheppey, with the exception of a central patch of Lower Bagshot sand, and forms the greater part of the northern and of its eastern coast. The Isle of Harty also contains a large similar deposit.

Rochester and Chatham entirely cover the small extent of chalk which reaches the west bank of the Medway at its mouth.

South of Rochester begins the range of hills, which, together with the "Pilgrim's Road," extends south-east as far as Charing.

The London clay, Woolwich beds and Old Haven beds again make their appearance. A narrow strip of the clayey deposits intervenes at Gillingham, and this broadens out in the district of Wychurch and Milton. At Sittingbourne it narrows somewhat, but varies in width further east as far as Faversham, where it is interrupted by a narrow strip of chalk.

*From Faversham to Reculver.*—Beyond Faversham the configuration of the clay deposit is again very irregular (further inland between Selling and Badlesmere it forms an isolated patch), but a little east of Boughton it broadens out into a large, roughly quadrilateral area, measuring nearly twelve miles east and west (from Boughton to Chislet near the Stour), and about six miles north and south (from Whitstable to the neighbourhood of Canter-

bury). Whitstable, Herne Bay, and Reculver are the only resorts of importance occurring in this area.

*From Reculver to the North Foreland.*—The alluvial surface lying east of Reculver and of Chislet, which is continuous with the alluvial valley of the Stour and with the Sandwich alluvium and sands, and the chalk formation of the Isle of Thanet, complete the north coast; but it is advisable to draw attention at this stage to the Minster deposit of London clay extending as far as the shore of the Pegwell Bay, north of the Stour, and to the larger additional deposits south of the Stour, which form a group nearly eleven miles long from the neighbourhood of Canterbury to that of Sandwich. These would form one continuous deposit with the Whitstable and Herne Bay deposit, but for the alluvial valleys of the Stour and of its tributaries the Greater Stour and the Lesser Stour, which lead to their fragmentation.

By way of recapitulation we may retrace our steps along the coast line from east to west. We find chalk extending from the North Foreland to Birchington, then alluvium as far as Reculver. From Reculver to Seasalter (west of Whitstable) London clay. Then alluvium again as far as Gravesend, with the exceptions already mentioned of Gillingham and of Hoo (clay), and of Chatham and Rochester (chalk).

*The London Clay.*—It will be observed that the London clay, associated with the Woolwich and Old Haven beds, extends almost continuously from Gillingham to Sandwich, the only interruptions being caused by the broad alluvial deposits by which they are flanked. It might therefore be stated in very broad terms that, with the exception of short intervals of chalk between Erith and Gravesend, and again at Chatham, the whole river-side and coast from London to the Isle of Thanet is contributed by London clay, lined more often than not by a margin of alluvium.

(B) **The East Kentish Coast.**—The distance between the North and the South Foreland requires to be divided into a short section belonging to the Isle of Thanet, and a rather longer section further south.

(a) *From the North Foreland to Cliffs End.*—The Thanet cliffs maintain their average height all along this distance, including Broadstairs and Ramsgate. But beyond the western boundary



of this town they rapidly decrease, and finally subside at Cliffs End.

(b) *From Cliffs End to the South Foreland.*—From Cliffs End to Shellness Point the subsoil is alluvial, and forms part of the alluvial deposit of the Stour Valley.

(c) *From Shellness Point to Kingsdown*, the coast remains equally flat, but its features are the Sandwich and Deal sandhills or dunes, now so beneficially used by golfers.

(d) *Lastly, from Kingsdown and onwards* the chalk cliffs rise once more, and afford at St. Margaret's-at-Cliffe considerable protection.

The whole district and the towns which have been named will be described in detail elsewhere.

(C) **The South Coast of Kent.**—*From the South Foreland to Folkestone.*—The South Foreland is the landmark which divides the eastern from the southern coast; but the geological division occurs farther north, since from Deal onwards the Kentish tract of chalk faces the sea, and at Kingsdown gradually rises into cliffs which range almost uninterruptedly as far as Folkestone.

A little north of the South Foreland we find, at St. Margaret's Bay, a site of climatic importance, and Dover and Folkestone, the other two objects of interest, will likewise receive separate consideration.

*From Folkestone to Rye.*—North of Folkestone the narrow belt of gault crops out in Eastwear Bay, at the foot of the chalk cliffs. At Sandgate, Shorncliffe and Hythe, the shore is formed by the lower greensand.

Immediately west of Hythe begins the alluvial territory of Romney Marsh, which forms the sea front as far as the borders of Sussex near the mouth of the Brede. It is bounded to the north by the broad belt of wealden clay, and in an artificial manner, by the Grand Military Canal.

Inland at Kennardington the clay passes into the Hastings sands, but the alluvial deposit which separates it from the sea extends, with multiple prolongations, along the course of the Rother, running between Sussex and Kent, and the Brede in Sussex.

At the eastern extremity of this alluvial area the height of

Lympne overlooks the sea from the north side of the Grand Military Canal. In the Romney Marsh proper, Dymchurch occupies the sea front, guarded by a sea wall, and faces the south-east. New Romney, Lydd, and Rye itself, are all three one to three miles distant from the sea.

#### CHISLEHURST.

(The particulars relating to Chislehurst have been furnished to the Reporter by his friend Mr. John Dewrance, C.E., of Cranmore-place, Chislehurst.)

Any one leaving London by the main line of the South Eastern Railway will notice that the small houses extend almost without a break as far as Lewisham. The ground is low and flat until New Cross station. Beyond this begins the rise, which stretches from Forest Hill to Blackheath. The ground drops again in a gentle sweep till Grove Park is passed. It then rises once more, and a tunnel of considerable length marks this second elevation. Beyond the tunnel, the character of the country is entirely changed, and on either side of the railway the wooded slopes of Chislehurst and Bromley constitute the most undulating and broken piece of land round London.

Beyond Chislehurst the country falls and becomes flatter until it rises gently towards the chalk hills behind Orpington. Between Orpington and Croydon lies probably the most picturesque country within equal distance of London. Beyond Orpington the North Downs rise gradually to heights varying from 400 to 700 feet, and run across the country to Folkestone.

Close to Chislehurst railway station a chalk pit will be noticed, which shows the abrupt termination of the bed of clay which extends from the river to the village. North of the railway the ground rises very considerably to the Common at Chislehurst, which is 308 feet above the sea-level. On the Common, which is covered with gorse and bracken, the rolled flint deposit, which is perhaps the most remarkable geological feature, is specially abundant, and suggests that the name of the locality may have been originally Chisel-stone-hurst. The Common and the high ridge east of the station command good views of the surrounding country and of the wooded height of Shooter's Hill.



As previously stated, the deep stratum of chalk crops out in an isolated patch near the railway station. Elsewhere it is covered in with various proportions of gravel, ballast, Oldhaven beds, sand and loam, and in some parts clay. Indeed, the formation varies with almost every undulation from sand to gravel and loam. It will be observed that for the greater part pervious strata lie at the surface of the absorbent bed of chalk.

At the same time, both the air and the soil are free from the degree of dryness which characterises chalk districts, and although fir trees occur, the variety of tree growth, no less than the richness of the verdure, are indications of an abundant rainfall and of some degree of retentiveness of moisture. Meteorological observations are not available at any spot nearer than Croydon.

The slope from the Common to the railway is thickly studded with residences, surrounded by gardens, and sheltered from the north and east winds. The large influx from London of residents whose lives are partly spent away from Chislehurst renders any estimate of the local factors influencing the frequency of various diseases extremely uncertain.

**Dr. G. H. Wade's Report on the Local Prevalence of, or Immunity from, Diseases.**—"Anæmia, debility and scrofula are of average frequency.—Diseases of the respiratory organs: less than average. An average amount of bronchitis and catarrh. Very little pleurisy and pneumonia: *great immunity from asthma.* .

"Renal diseases, uncommon. I have not attended one case of acute dropsy in twenty years. Chronic albuminuria: very few cases, chiefly visitors. Calculus and gravel: I do not remember a case of calculus since the Emperor Napoleon III. was here.

"Rheumatoid arthritis, neuralgia and rheumatism are of considerable frequency.—Diseases of the skin, few.

"No malaria or endemic diseases. Very little typhoid and diarrhœa. Scarlet fever and diphtheria, prevalent lately.

"Among the permanent residents there are very few deaths and many aged persons.

"The whole district is drained into a common main discharging at a distance.

"The water supply is conveyed by pipes from a distance; very hard water."

## SEVENOAKS AND DISTRICT.

The following notes were contributed by the late Mr. F. Legros Clark, writing from the district of Riverhead :—

"The soil varies. But sand crops out, near, or on the surface at many parts. In others, wragstone is found in abundance, as in my property where the surface soil is a rich loam. The railway tunnel beneath the town of Sevenoaks is through chalk, from which an abundant supply of remarkably pure water is obtained and supplied to the town and neighbourhood by a company.

"The locality is cold, but bracing and healthy. The thermometer in my garden has reached zero this winter. I have noticed that we are rarely visited, in the valley, by heavy thunder-storms.

"I have heard it said, rather than I have observed, that there is a good deal of rheumatism : I think not more, probably, than in most other places.

"There is a system of main drainage, scarcely yet completed, for the town and neighbourhood. The locality is certainly not subject to epidemics ; and the inhabitants attain full average age. There are three or four between 80 and 90 in my small district.

"From my own personal experience, and from general observation, I should say that this district is healthy ; but I should scarcely recommend it as a residence for sufferers from pulmonary complaints."

## TONBRIDGE.

Dr. James Pollock, F.R.C.P., has contributed the following notes :—

"The town of Tonbridge is situated in a wide valley on the River Medway which is navigable for barges up to this point, several locks maintain the water level necessary for navigation, but they cause frequent overflows of the river, and the lower part of the town is often under water in severe rains. These floods also often extend for miles along the river, which on either side is bounded by alluvial meadows."

"The upper part of the town is at a higher level of about 120 feet. In it are situate the best dwellings and the well-known



Grammar School supported by the Skinners' Company. During a residence of some years in the neighbourhood I have not known of any epidemic, and I consider the locality of the school healthy, though somewhat relaxing. The soil is loam and wragstone. The country about is rich in hop gardens and the heights on both sides of the town are well wooded. The climate is moderate and relaxing. There are but few additions to the buildings, as Tunbridge Wells, which is at a much higher level and a fashionable resort, is only five miles off. The Sevenoaks range of hills forms a series of picturesque heights from three to five miles off on the other side, and there is a richly wooded country up the Medway where the heights more nearly approach the river."

"The winters are moderate, thunder-storms are rare, the summers relaxing."

Some idea of the local meteorology will be gathered from the tables on the following pages, specially prepared for this Report.

#### TUNBRIDGE WELLS.

Tunbridge Wells, with an estimated population of 27,984, lies on the borders of Sussex and Kent, but chiefly within the latter, at a distance of 32 miles from London. The picturesque and heathful features of the surrounding country have assisted in establishing the reputation of a healthy resort which it has enjoyed for upwards of 250 years. The district belongs to the sandstone series of the Wealden system. Its undulating but fairly open surface yields an extensive panorama from the higher parts of the town. The commons known as the Tunbridge Wells and the Rusthall Commons cover an area of 280 acres of relatively high ground, and present attractive views and interesting sand rocks, to which popular imagination has attached fancied resemblances (Toad Rock, Parson Rock, etc.). The surrounding country affords a large choice of enjoyable drives and walks.

The town is well built, if somewhat irregularly, with broad streets and paved foot-paths. Avenues of trees are planted along some of the streets. In spite of the absence of any open expanse of water or of any important river, the foliage is luxuriant. The town presents no special features of historical

## TONBRIDGE.

## I.—MONTHLY MEANS FOR TEN YEARS (1880—1889), OR AS MUCH OF THAT PERIOD AS COULD BE OBTAINED.

*Table specially prepared for the Report to the Royal Medical and Chirurgical Society.*

Month.	Mean Pressure of Atmosphere in Month. (9 A.M. & 9 P.M.)	TEMPERATURE OF AIR IN MONTH.						Mean Relative Humidity (9 A.M.)	Mean Maximum in Sun.	Amount of Sunshine.	WIND (9 A.M. & 9 P.M.)					Mean Ozone.	Mean Cloud (9 A.M.)	RAIN.	
		Highest.	Lowest.	Range.	Mean of Highest.	Mean Lowest.	Mean Daily Range.				Calm.	N.	E.	S.	W.			Days it fell.	Inches.
January ..	...	54.7	0.5	54.2	42.4	32.7	9.7	37.6	91	...	...	...	...	...	...	...	7.2	12	1.68
February ..	...	56.3	22.6	33.7	46.6	35.9	10.7	41.3	90	...	...	...	...	...	...	...	7.5	14	2.59
March .....	...	67.4	22.0	45.4	50.9	35.7	15.2	43.3	80	...	...	...	...	...	...	...	5.5	9	1.29
April .....	...	68.5	25.8	42.7	55.0	39.5	15.5	47.3	73	...	...	...	...	...	...	...	6.3	11	1.57
May .....	...	83.5	29.1	54.4	63.1	44.2	18.9	53.7	66	...	...	...	...	...	...	...	5.5	8	0.90
June .....	...	83.6	36.9	46.7	66.9	49.6	17.3	58.3	71	...	...	...	...	...	...	...	6.8	12	2.03
July .....	...	94.2	40.8	53.4	71.5	53.5	18.0	62.5	71	...	...	...	...	...	...	...	6.2	15	2.27
August .....	...	90.2	41.3	48.9	71.3	53.0	18.3	62.2	74	...	...	...	...	...	...	...	5.9	10	1.40
September..	...	86.6	33.3	53.3	65.6	50.2	15.4	57.9	85	...	...	...	...	...	...	...	6.6	15	3.02
October .....	...	68.6	24.5	44.1	55.3	42.0	13.3	48.6	87	...	...	...	...	...	...	...	6.5	17	4.13
November ..	...	62.5	24.2	38.3	49.8	38.2	11.6	44.0	89	...	...	...	...	...	...	...	6.2	16	3.17
December ..	...	56.3	19.1	37.2	45.0	36.0	9.0	40.5	92	...	...	...	...	...	...	...	7.4	16	2.50



## THE CLIMATE OF KENT

## TONBRIDGE.

II.—QUARTERLY AND YEARLY MEANS FOR TEN YEARS (1880—1889), OR AS MUCH OF THAT PERIOD AS COULD BE OBTAINED.  
*Table specially prepared for the Report to the Royal Medical and Chirurgical Society.*

QUARTERS AND YEAR.	Mean Pressure of Atmosphere. (9 a.m. & 9 p.m.)	TEMPERATURE OF AIR.						Mean Relative Humidity (9 a.m.)	Mean Maximum in Sun.	Amount of Sunshine.	WIND (9 a.m. & 9 p.m.)					Mean Ozone. (9 a.m.)	RAINS.	
		Highest.	Lowest.	Range.	Mean of Highest.	Mean of Lowest.	Mean Range.				Calm.	N.	E.	S.	W.		Days it fell.	Inches.
Jan.—March .	...	67.4	0.5	66.9	46.6	34.8	11.8	87	...	...	...	...	...	...	...	6.7	35	5.56
April—June...	...	83.6	25.8	57.8	61.7	44.4	17.3	70	...	...	...	...	...	...	...	6.2	31	4.50
July—Sept. ...	...	94.2	33.3	60.9	69.5	52.2	17.3	77	...	...	...	...	...	...	...	6.2	40	6.69
Oct.—Dec. ...	...	68.6	19.1	49.5	50.0	38.7	11.3	89	...	...	...	...	...	...	...	6.7	49	9.80
Whole Year...	..	94.2	0.5	93.7	57.0	42.5	14.5	81	...	...	...	...	...	...	...	6.5	155	26.55

interest. "The Pantiles" is an ancient promenade dating back to 1638.

The porous nature of the soil causes any surface water to be quickly absorbed and keeps the air dry. The town is almost exclusively residential and its climatic advantages are not interfered with by any extensive factories.

**The Climate and its Therapeutic Effects.**—The climate is of the dry and bracing inland type. It owes its peculiarities to the geological situation and to the formation of the surface. Between it and localities not far distant, but lying on different strata, as for instance Tonbridge, the climatic differences are great. The winter temperature is too cold for the treatment of most chest complaints and of other affections needing an equable climate. In summer the heat is said to be tempered by cool breezes. The principal features of the climate are its dryness and bracing quality, and its chief benefits are seen in conditions of lowered vitality and of anæmia, in convalescence from serious diseases, in the rearing of delicate children, and with the help of due precautions in the preservation of health and activity in old age.

The well situated on The Pantiles is the most important of the mineral springs to which the town owes its name and its fame. The water is clear and bright and free from astringent taste, containing iron in the state of ferrous carbonate exclusively.

An account of its composition and therapeutic effects of the water will be found in the section on balneology.

*The Local Prevalence of, or Immunity from, Diseases.*

A. *Anæmia and Debility.*—These are not specially prevalent and are much benefited by the climate. According to one observer they are found among residents only in insanitary dwellings, and persist until the cause is removed. Pernicious anæmia does not occur. The anæmia due to malignant disease is said to prevail concurrently with a growing prevalence of cancer, in adjoining parts, belonging to the Wealden area of Kent (Tonbridge).

B. *Scrofula and Tubercular Diseases except Phthisis.*—Under this head is reported a prevalence of glandular affections in the outlying villages, owing to the proximity of wells to latrines,



these affections being easily cured by remedying sanitary defects or by the water being boiled before use. One observer reports strumous enlargement of cervical glands as quite common; but this is not in accordance with statements from others. Tubercular affections of bone and of skin are often observed among the rural population suffering from insanitary conditions of life. All agree in regarding the climate as beneficial for scrofula.

*C. Diseases of the Respiratory System :—*

1. Phthisis with special reference to Hæmoptysis. Some difference of opinion is apparent in the reports in connection with the prevalence of phthisis, which may therefore be regarded as of average frequency. Hæmoptysis is stated to be uncommon.
2. Bronchitis and Catarrh. These affections are prevalent though not particularly severe. By some they are regarded as largely determined by gout; but the climate is acknowledged to be cold in winter.
3. Pneumonia is rather prevalent but not exceptionally severe. One observer states that sthenic pneumonia is rare.
4. Pleurisy occurs with average frequency but is usually mild.
5. Eczema is described by most as being uncommon, except the uraemic variety; ordinary eczema is often benefited by the climate.

*D. Renal Diseases :—*

1. Acute nephritis is stated not to be common, generally due to scarlatina, and rising and falling with the frequency of the latter every third year. Cases are said to do well.
2. Chronic nephritis is uncommon among the rich, and affects especially males. Some observers regard it as of average frequency. The climate cannot be described as particularly suitable for either variety.
3. Calculus and gravel are not specially prevalent, some describe them as rare. Stones have generally consisted of uric acid according to Mr. Lammiman.

*E. Rheumatism, Rheumatoid Arthritis and Neuralgia :—*

1. Acute rheumatic attacks are reported as infrequent. The more chronic varieties of rheumatism are prevalent.
2. Rheumatoid arthritis according to one observer is not prevalent, by another it is described as exceedingly common.
3. Neuralgiae, and in particular facial neuralgia, are extremely prevalent.

*F. Diseases of the Skin, particularly Eczema :—*

These diseases are not prevalent. Eczema occurs under insanitary conditions among the rural population and is of varied

frequency as well as psoriasis and herpes. The climate is beneficial to cases originating at the seaside and to the varieties due to debility.

*G. Endemic Diseases:—*

1. Malaria is unknown. Visitors who have suffered from the disease are benefited by the climate. 2. Typhoid occurs in batches chiefly among the residents. One observer had only seen four cases in eight years. 3. Diarrhoea of severe or intractable nature is not prevalent. 4. Diphtheria is rare. Endemic tonsillitis is very common in connection with sanitary imperfections in the rural districts. 5. Scarlet fever is not prevalent and usually not severe. Small epidemics are said to occur about once in three years.

*Age at Death.—The Commonest Causes of Death:—*

1. Old age is reported to be very common, for instance, Mr. Connan writes:—"Of the deaths I have certified, 20 per cent. were over 60; 11 per cent. over 70; and 5 per cent. over 80 years."

Dr. Elliott writes:—"I find that out of 235 deaths certified by me during the last nine years—

Bronchitis claims...	41	Diarrhoea in old people ...	3
Chronic phthisis pulmonalis	24	Apoplexy (cerebral) ...	12
Pneumonia ...	13	Cancers... ..	15
Heart Diseases ...	14	Senility (simple)... ..	15
Diarrhoea in infants ...	10		

"The frequency of old age among permanent residents is very great. Out of the above 235 deaths, 1 was over 95; 15 over 85; 10 over 80; 25 over 75; 19 over 70; 22 over 65; and 12 over 60. In all 104." Dr. Stuart reports analogous frequency of old age in his former practice. Indeed it has long been recognised that Tunbridge Wells is good for old people as well as after serious illnesses.

2. No special frequency is attributed to any one disease as cause of death. One observer suggests the following order:—1. Tubercular affections. 2. Respiratory affections: *a.* Bronchitis; *b.* Pneumonia. 3. Kidney disease.

The following data are extracted from the Annual Report on the Health, Sanitary Condition, &c., of the Borough of Tunbridge Wells, for the year ending the 31st December, 1891, by William Stamford, L.R.C.P., &c., Medical Officer of Health. The death-rate for five years (corrected for population) reads as follows:—1887,



13·63; 1888, 14·30; 1889, 13·64; 1890, 13·57; 1891, 13·47. The mean death-rate for five years stands at 13·72. If the deaths of non-residents be excluded from the general death-rate, the latter would be reduced to 12·22 per 1,000 of the inhabitants.

*Duration of Life.*—Of 377 deaths at all ages 58 took place within the first year of life and 161 at or beyond the age of 60, or 42 per cent. of the deaths from all causes. In further detail 51 deaths occurred between 60 and 70, 64 between 70 and 80, 37 between 80 and 90, and 9 at ages exceeding 90. Only 28 deaths occurred between the ages of 5 and 25.

Analogous results are also recorded during the two preceding years. Thus the deaths below one year of age were 61 in 1889, 61 in 1890, 58 in 1891. Between one and five years of age 37, 40, and 30 respectively. Between five and fifteen 15, 11, and 7 respectively. Between fifteen and twenty-five 26, 11, and 21 respectively. Between twenty-five and sixty 95, 106, and 100 respectively. At 60 and upwards 138, 146, and 161 respectively, and the total death-rate per 1,000 13·64, 13·57, 13·47 respectively.

*Infant Mortality.*—Although high (97 per 1,000) this return may be regarded as very moderate compared to that of London (167 per 1,000).

The mortality from zymotic diseases was only 0·42 per 1,000 of inhabitants. The zymotic death-rate for England and Wales during 1891 was 1·83 per 1,000, or 4·3 times that of Tunbridge Wells.

Fifty-two cases of scarlet fever were notified; no death. Continued fever, measles, and smallpox gave rise to no mortality. Diarrhoea and dysentery caused only one death; diphtheria, four deaths; erysipelas and pyæmia, four deaths; whooping-cough, two deaths; croup, one death.

III. *Drainage.*—W.C.'s are in connection with the main drainage, and sewage is pumped to two sewage farms, north-east and south-west of the town. The drains have a good fall, and are ventilated in the roads.

IV. *Water Supply as Derived from Surface Springs.*—At Pemberry, some four miles distant, water is collected in a huge reservoir, whence it is pumped into the town. In Tunbridge Wells itself there are no wells except mineral. The Pantiles reservoir has been lately repaired so as to render its supply practically inexhaustible.

## TUNBRIDGE WELLS.

I.—MONTHLY MEANS FOR TEN YEARS (1880-89), OR AS MUCH OF THAT PERIOD AS COULD BE OBTAINED.  
*Table specially drawn up for the Report to the Royal Medical and Chirurgical Society.*

MONTH.	Mean Pressure of Atmosphere in Month. (9 A.M. & 9 P.M.).	TEMPERATURE OF AIR IN MONTH.						Mean Relative Humidity (9 A.M.).	Mean Maxima in Sun.	Amount of Sunshine.	WIND (9 A.M. & 9 P.M.).					Mean Ozone.	Mean Cloud (9 A.M.).	RAIN.	
		Highest.*	Lowest.*	Range.	Mean of Highest.	Mean of Lowest.	Mean Daily Range.				Calm.	N.	E.	S.	W.			Days it Fell.	Inches.
January ...	...	54.5	7.2	47.3	40.9	32.2	8.7	36.6	94	...	...	...	...	...	...	...	7.5	13	2.16
February ...	...	54.5	25.5	29.0	45.6	35.8	9.8	40.7	92	...	...	...	...	...	...	...	7.9	17	3.06
March .....	...	65.5	20.7	44.8	48.5	35.1	13.4	41.8	83	...	...	...	...	...	...	...	6.0	10	1.59
April .....	...	69.0	26.1	42.9	52.9	38.6	14.3	45.7	79	...	...	...	...	...	...	...	6.9	12	1.73
May .....	...	79.6	29.4	50.2	59.4	43.1	16.3	51.3	75	...	...	...	...	...	...	...	6.2	11	1.40
June .....	...	81.1	36.0	45.1	64.4	48.7	15.7	56.6	79	...	...	...	...	...	...	...	6.8	14	2.46
July .....	...	90.3	42.9	47.4	68.8	52.5	16.3	60.7	78	...	...	...	...	...	...	...	6.9	15	1.87
August .....	...	87.4	40.0	47.4	68.3	52.4	15.9	60.3	78	...	...	...	...	...	...	...	6.5	11	1.79
September ..	...	82.1	31.9	50.2	63.1	49.7	13.4	56.4	87	...	...	...	...	...	...	...	7.1	16	3.67
October .....	...	67.6	27.3	40.3	53.1	41.9	11.2	47.5	88	...	...	...	...	...	...	...	7.1	18	4.14
November ..	...	60.7	24.7	36.0	48.1	38.2	9.9	43.2	92	...	...	...	...	...	...	...	7.1	18	3.68
December ..	...	54.0	19.2	34.8	43.5	35.1	8.4	39.3	93	...	...	...	...	...	...	...	7.4	16	2.74

\* Highest and Lowest = Absolute Highest and Lowest in Period.



## THE CLIMATE OF KENT

## TUNBRIDGE WELLS.

II.—QUARTERLY AND YEARLY MEANS FOR TEN YEARS (1880-89), OR AS MUCH OF THAT PERIOD AS COULD BE OBTAINED.

*Table specially drawn up for the Report to the Royal Medical and Chirurgical Society.*

QUARTERS AND YEAR.	Mean Pressure of Atmosphere. (9 A.M. & 9 P.M.)	TEMPERATURE OF AIR.						Mean Temperature of Air.	Mean Relative Humidity (9 A.M.) %	Mean Maximum in Sun.	Amount of Sunshine.	WIND (9 A.M. & 9 P.M.).					Mean Ozone.	Mean Cloud (9 A.M.)	RAIN.	
		Highest.*	Lowest.*	Range.	Mean of Highest.	Mean of Lowest.	Mean Daily Range.					Calm.	N.	E.	S.	W.			Days it fell.	Inches.
Jan. —March .	...	65.5	7.2	58.3	45.0	34.4	10.6	39.7	90	...	...	...	...	...	...	7.1	40	6.81		
April—June...	...	81.1	26.1	55.0	58.9	43.5	15.4	51.2	78	...	...	...	...	...	...	6.6	37	5.59		
July—Sept. ...	...	90.3	31.9	58.4	66.7	51.5	15.2	59.1	81	...	...	...	...	...	...	6.8	42	7.33		
Oct.—Dec. ...	...	67.6	19.2	48.4	48.2	38.4	9.8	43.3	91	...	...	...	...	...	...	7.2	52	10.56		
Whole Year ...	...	90.3	7.2	83.1	54.7	42.0	12.7	48.3	85	...	...	...	...	...	...	6.9	171	30.29		

\* Highest and Lowest = Absolute Highest and Lowest in Period.

## ASHFORD.

(From notes kindly supplied by Mr. W. H. Coke, L.R.C.P., M.R.C.S., &c., Medical Officer of Health.)

Ashford (or Estefort, as it is called in Domesday Book at the time when it formed part of the possessions of Hugo de Montfort, who came over with the Conqueror, or, in other ancient works, Esshetisford, taking its name from the river, which, as Lambarde says, ought not to be called the Stour, but the Esshe, or Eschet) is a thriving market town (the weekly market for stock and corn, held every Tuesday, dates from the time of Edward I.) with an ancient church. It owes much of its present prosperity to the South-Eastern Railway Works, which employ about 1,200 men, and is cared for by a Local Board.

The town stands on an elevation about 200 feet above the sea-level, and the soil consists of gravel with greensand beneath. East and south are fertile pastures; to the west the soil is in general sandy, with much quarry stone mixed with it.

The views on the north side, looking towards Kennington, Eastwell, and the Wye Downs, on the west, towards Hothfield, and on the east, towards Willesboro, are very pretty; that in a southerly direction is not so good, as the land extending towards Romney Marsh is much flatter.

**The Seasons.**—The winter is generally very bleak, the prevailing winds from Christmas to the end of April being north-east. Spring commences usually about the middle of April, and the summer is generally very enjoyable, the autumn commencing about the middle of September, though it is not uncommon to have a very fine October.

**The Vegetation.**—Very fine hops are grown in the neighbourhood of Ashford. The present mode of growing them on string, either attached to the top of the poles or from the middle of one pole to the top of the other, renders the gardens, just before picking time, which is generally about the first week in September, a very pretty sight, the hops hanging in elegant festoons; this plan also guards somewhat against the danger of injury from high winds, which will so often, in a single night, transform a lovely garden into a blackened mass, in many cases not worth the picking.



To the lover of natural history Ashford affords a varied field, there being within easy reach down land, pasture and arable and marsh land, each affording different fauna and flora. On the Wye Downs most of the wild orchids, such as the bee, fly, spider, pyramidalis, and the grandest of all English orchids, the *Orchis fusca*, are to be found. Numerous birds also build in this neighbourhood, such as the different kinds of buntings, the nightjar, and sparrow-hawk. In the pine woods on the Westwell Downs are numerous squirrels' nests in the spring. The spotted and green woodpeckers and nuthatches are also to be found in the surrounding woods, which resound in the spring with the lovely and varied notes of the nightingale.

As winter approaches and the southerly gales set in, it is no uncommon sight to see in the fields hundreds of seagulls which have been driven inland by stress of weather. The curlew may also be noticed in the winter in considerable numbers.

*The Local Prevalence of, or Immunity from Diseases.*

*Anæmia and Debility.*—This is very prevalent here, but chiefly amongst those working as dressmakers and servants. The climate is bracing, and well suited to cases of this description, of course aided by rest.

*Scrofula and Tuberculous Diseases.*—Not common.

*Diseases of Respiratory Organs.—Phthisis.*—The death-rate is a good guide for these diseases. I find, in my returns as Medical Officer of Health for the period between 1882 and 1890, the following results:—

Year.	Phthisis.	Bronchitis.	Pneumonia.	Death-rate for the same period.	Deaths in persons 60 Years of Age and upwards.
1882	7	8	11	15·2	40
1883	15	5	8	14·5	35
1884	15	14	12	16·3	49
1885	11	18	8	14·5	52
1886	14	6	4	13·1	40
1887	8	12	6	12·2	51
1888*	9	22	13	14·0	57
1889*	6	23	13	10·9	49
1890	15		32	14·3	58

\* Influenza was very prevalent.

*Asthma* is not very common in this neighbourhood.

*Renal Diseases*.—Renal complaints are not common. *Calculus* is not at all common. *Rheumatism*.—This is rather prevalent. *Rheumatoid Arthritis*.—Very few cases. *Neuralgia*.—Common; mostly facial, and traceable to defective teeth.

*Endemic Diseases*.—*Malarial Affections*.—When I first came here (1876) ague was tolerably prevalent, mostly amongst those who had resided in Romney Marsh, now it is a very uncommon thing to meet with a case. *Typhoid*.—Tolerably prevalent; in nearly every case traceable to defective water supply.

*Drainage*.—Ashford proper stands high, and the draining of the town is a tolerably simple matter. That part on the south of the South-Eastern Railway—viz., South Ashford—lies low, and is not so easily managed. The system is that of gravitation, and the South Ashford sewage has to be pumped to the station, where it is finally treated by lime (15 grs. to the gallon); after mixing with this, and the coarser part being separated by means of a screen, it passes into hot tanks back to No. 2, then to No. 1 effluent tank, thence to No. 2, and into a well from which it is pumped on to land (about eight acres, thoroughly subdrained at a depth of four feet by about two miles of pipes), for the purpose of filtration, and thence the effluent passes into the river. The effluent is very good, and since the adoption of the sewage system the river is in a far cleaner and more sanitary state than previously.

The water-supply is derived from wells at Herwood, about a mile or so out of the town, and is tested at regular intervals by some well-known analyst, and has always been pronounced excellent.

#### GRAVESEND

The following account has been communicated by Dr. J. H. Gramshaw :—

“Gravesend lies on the south bank of the Thames, and is therefore much exposed to north and east winds, and in some degree to those from the west; but the ground is rather higher at Rosherville (to the west), and therefore on that side the exposure is not so complete.

“The soil of Gravesend is chalk. Windmill Hill (about 300 feet) is a great boss of sand and gravel about the centre of the



two parishes (Gravesend and Milton), and about a quarter of a mile from the river. From the hill there is a gradual descent on all sides, insuring tolerable drainage. The river at high water is four fifths of a mile broad.

"The ground rises slightly from the river, or from within twenty yards of it. In the streets running parallel with it, which are difficult to drain on account of their lowness—the water at spring-tides frequently comes into the cellars. Houses beyond these streets are not affected. There are now several streets built near Milton Church, principally labourers' cottages, on the eastern side, two or three hundred yards from the river, and their elevation is but slightly above it. These are very much exposed to north and east winds, and suffer accordingly. They abut on marshes, and have no protection. Much chest disease exists there.

"On the other side of the river are, westward, Tilbury Docks; eastward Tilbury Marshes and Tilbury Fort. The docks have completely drained the marshes to the west.

"During the last few decades trees have been planted in the streets and elsewhere, and the town wears a very different aspect to the Gravesend of fifty years ago.

"Gravesend is too far from the sea to be much affected by ocean currents. The air during a great part of the year is very moist from the neighbourhood of so much water, and it is cold also. This is always noted by London residents during a stay here. Again, hot weather is always very hot. There is a good deal of fog in the winter. *Sunshine* is probably rather below the average. The *rainfall* is not great. Last year it was only 22 and 9·16 inches. Gravesend is dry—very dry in summer, and the surface soon dries after rain, even in winter. The lack of moisture does not, however, extend very deeply into the earth. A few feet below the surface dampness seems to prevail more than in other soils. Is this from the chalk?

"*To sum up*: Gravesend is hot in summer, and cold in winter—when there is much moisture. Easterly winds prevail much in winter and spring. *Sunshine* is deficient in winter.

"The most remarkable circumstance connected with the health of the town is the complete *absence* of ague. Formerly ague was exceedingly prevalent in the east of the town, but now it is unknown. At the same time it has become much less prevalent

also at Tilbury Fort and the neighbourhood, although the marshy district to the east still remains. Is this result due to the growth of trees, to the improvement in the condition and in the food of the inhabitants, or to both?

"The western districts of the town are pleasant and healthy. The eastern districts are not suitable for patients with a delicate chest. Convalescents who merely require a bracing climate could probably not find a much better summer residence than Gravesend.

"Few persons are sent here now for change of air. They mostly go farther afield, and do not consider this equal to a seaside residence."

*The Local Prevalence of, or Immunity from, Diseases.*

From a valuable report drawn up by the members of the Medical Staff of the Gravesend Hospital, and from two isolated reports from gentlemen practising in Gravesend, some important facts may be extracted as possessing special interest:—

1. The prevalence of anæmia among resident females, and also among visitors.
2. The non-prevalence of scrofula and tuberculosis (although phthisis is of average frequency)—of pneumonia and pleurisy (although bronchitis and catarrh are very prevalent).
3. The great rarity of acute renal dropsy, whilst chronic renal disease is not unusually prevalent.
4. The rarity of gravel and calculus.
5. The rarity of acute rheumatism, chronic rheumatism being very common.
6. The especial frequency of rheumatoid arthritis and neuralgia.
7. The frequency of eczema.
8. The absence—some say infrequency—of malarial affections, which were formerly more prevalent.
9. The absence of epidemics of typhoid (sporadic cases continue to occur), of diarrhœa, scarlet fever, diphtheria, although endemic sore throat is common in spring.

It would be difficult to mention any common cause of death. Many persons are very long-lived.

*Drainage.*—The town lies on a descent to the river. The streets are drained into the river; the houses into deep cesspools, which were originally in many instances wells, and are now disused as such.

*Water Supply.*—Scarcely any wells remain. The water comes from works which derive it from a deep well, or wells in the chalk;



it is very pure, as often found by analysis by Dr. Gramshaw and as confirmed by Dr. Dupré. Its solids, however, are large, 30 to 40 grains per gallon, almost entirely chalk.

### CHATHAM.

The towns of Chatham and Rochester do not lay claim to the qualification of health resorts. Nevertheless their size and importance would have justified more than a passing mention. From a climatological standpoint, their estuarine situation, their varied configuration, their soil, and their meteorology,<sup>1</sup> are worthy of careful study. As regards public health, it may be gathered from the following report that the local conditions do not greatly differ from those common to other large towns.

*The local prevalence of, or immunity from diseases, by J. Holroyde, Esq., M.R.C.S. Eng., &c., Medical Officer of Health for Chatham.*

*Anæmia* and Debility:—Not unduly prevalent.

*Scrofula* and Tuberculous Diseases:—Fairly common.

*Diseases of Respiratory Organs*:—*Phthisis*:—Above the average. No special liability to hæmoptysis. Other respiratory affections are not unduly prevalent.

*Renal Disease*.—Acute Renal Dropsy:—Of average frequency.—Chronic Albuminuria and Granular Kidney:—About the average.—Calculus and Gravel:—Uncommon.

*Rheumatic Fever, &c.*—All very prevalent. Skin diseases, particularly eczema, common.

*Endemic Diseases*:—Malarial affections of a mild type are common. Typhoid:—Not unduly prevalent. Diarrhœa:—Prevalent. Scarlet Fever, Diphtheria, Endemic Sore Throat:—Not unduly prominent.

Old age is very frequent.

The main causes of death are convulsions, bronchitis, phthisis, decay of nature.

The drainage is by a system of sewers into the river: in

<sup>1</sup> "A meteorological detail of great interest is the small rainfall of Rochester. For instance, in the very wet year of 1891, the rainfall at Rochester was—27·97 inches at Knights Place, only 19·96 at Abbots Court, Hoo, 20·91 at Hoo St. Mary, and 23·89 at Cooling Castle. At Sheppey, Leysdown, it was 20·37." (Reporter, from *Symons British Rainfall*.)

some cases slop waters are carried off by these sewers. Excreta and slops are collected into cesspools.

The water supply is from deep wells in the chalk, very abundant and of good quality.

#### THE ISLE OF SHEPPEY.

The following description is from the pen of Julius Cæsar, Esq., M.R.C.S.Eng., &c., Medical Officer of Health for the Sheppey Rural District:—

The Island of Sheppey, so-called, I believe, from the number of sheep reared on it, is situated on the north coast of Kent, bounded by the rivers Thames and Medway on the west, the Swale on the south, and the German Ocean on the north and east. It is eleven miles long from Sheerness pier to Sheerness point, and four miles broad from north to south.

Sheerness, the extreme point east of the island, consists of marshes, in places from ten to fifteen feet above sea-level and in places submerged in winter. It is about two miles by one and a half in extent.

From this point the island opens out, and elevations and depressions appear more or less well marked till we get well to the west of Leysdown, with Warden on its north side; here the cliffs begin and continue in an unbroken line for nearly six miles, in parts reaching an altitude of nearly 250 feet above sea-level.

From this north-east aspect the island slopes away to the south and west.

These cliffs are formed of London clay, capped by a stratum of sand and gravel belonging to the Bagshot series, extending to a depth of about thirty feet, then comes the soil proper composed of loamy clay. As a whole, the island would be justly looked upon as sparsely provided with trees; but this fact is not due to any unsuitableness of the soil, but to the exigences of agriculture. At one period it was very well timbered, and is so now in certain localities. This is especially the case in the upland districts—those of Warden and Eastchurch—where all kinds of trees flourish, more particularly elms, sycamores, thorns, ash, chestnut, walnut, hollies, araucarias, and other conifers; in fact, most of the members of order Pinaceæ do well here. Evergreen shrubs also thrive—such as laurels, laurestinus, and euonymus—these at



times assuming the proportions of trees. It may be well to remark that outdoor ferns, or moss of any kind, do not grow here; in fact, the former will not. It is most unusual to see a tree with lichen on it, or a house with moss. In places not cultivated the undergrowth is not luxuriant, nor the soil boggy.

From the physical characters of the upper part of the island and its geological formation, it will be at once apparent that it possesses every advantage for thorough natural drainage, and this is materially aided by extensive artificial means. The north-east, east, and south-east are well furnished with timber, which extends inland for about a mile and a half, or two miles in places. These effectually protect parts from fogs and wind. Winter might be described as mild, spring is bleak, summer late and hot, autumn prolonged and exceedingly mild.

The island, with the exception of Sheerness, which is a naval station, being a purely agricultural one, its meteorology has not been studied in such a systematic manner as to furnish reliable data for deductions in this matter; but, speaking generally, the following may be relied upon as fairly accurate:—

The Gulf Stream is said to raise the temperature nearly one degree, and this is partly borne out by the fact that when snow falls it quickly melts. Other parts of Kent may be viewed covered with it while this place is quite free.

The climate is decidedly bracing. Average mean temperature, m. 43·8, max. 55·3. Humidity, 44·10 A.M., 44·6 P.M. Prevailing winds, south-south-west. Sunshine average, 4·38; highest, 14·50. Rainfall,<sup>1</sup> 1892, 26·86. Number of days on which ·01 inches or more fell, 173. (Averages of past six years, 21·86 and 172.)

**Eastchurch** is situated about the centre of the island, at an elevation of about 250 feet above sea-level at its highest point, and sloping away to south and south-west. Here the Bagshot sands and gravel are of considerable depth, and the soil is rich and loamy. Its elevation and the geological formation of its soil insures very good natural drainage. It is well protected from winds and fogs by a belt of trees which surround it on three sides, leaving the south-west aspect more open than the others.

The village is well drained by pipes running east, south, and

<sup>1</sup> The rainfall is remarkably small, only 20·37 inches fell in the very wet year 1891. (See Symons' *British Rainfall*.)

west, and having their outfalls far removed from the vicinity of dwellings. The water is abundant and of good quality, and obtained from wells or springs; but there is no house-to-house supply. The domestic sanitary arrangements are reasonably good, the dry-earth system prevailing. All cow-sheds, dairies, and pig-pounds are carefully looked after by the sanitary inspector.

The population is nearly 1,000, and the deaths for 1892 nine, and accounted for as follows:—1 accidental drowning. 1 asthenia, 2 convulsions, under twelve months old. 1 æt. 44, pneumonia after influenza. 1 æt. 5, pulmonary tuberculosis. 1 æt. 88, natural decay. 1 æt. 61, cardiac syncope. 1 æt. 39, phthisis, a visitor.

The general physical character of the district is undulating, with good protection from winds on north-east aspect, and exposure to south, south-west, and north-west.

The climate is bracing, and has proved most beneficial in most pulmonary complaints, especially of a tubercular nature, with the exception of asthma, more particularly if of a malarial nature. Its effect on strumous cases is decidedly good. Anæmia is always benefited by a sojourn here.

Renal diseases, if far advanced, do not usually improve here, but the early stages derive benefit.

The climate wonderfully improves the appetite and is most restorative to the jaded and overworked, mentally or physically. The plethoric do not usually derive so much benefit as those of an opposite habit of body. Visitors usually agree that they sleep unusually well here.

*The Local Prevalence of, or Immunity from, Diseases.*<sup>1</sup>

A. Anæmia and debility are rare, the former being confined almost exclusively to the domestic servant girl class. A return to the island usually cures this, or at least materially improves it.

B. Scrofula and tuberculous diseases are very rarely met with among the residents. Children sent down from London suffering from the former always rapidly improve. A large number come here every year.

C. Phthisis is not at all common in the upper parts of the island, only one death from this cause in Eastchurch for the year 1892, and this was in the person of a visitor. *Hæmoptysis* is exceedingly rare.

<sup>1</sup> These statements refer only to the upland districts.



Bronchitis does well, chronic bronchial catarrh not so well. These are, perhaps, the commonest complaints among those over forty. Pneumonia is not common. Pleurisy is not unusual, especially among those between twenty and thirty. Asthma is pretty common among elderly people, very rare before forty.

D. Acute renal dropsy is not common; chronic albuminuria, with granular kidney, does occur, but not often. Calculus and gravel are very rarely met with.

E. Rheumatism and rheumatic arthritis are rather common among the labouring classes, especially farm labourers. Neuralgia is not often met with.

F. Skin diseases of all kinds are exceptionally rarely met with, eczema being almost the only form.

G. Endemic Diseases. Malarial affections in one form or another are about the commonest complaints.—Typhoid fever: not a case for some years.—Diarrhœa is not common, even among the young.—Scarlet fever does prevail at times, with intervals of comparative immunity of three or four years.—Diphtheria: no case for some years.—Endemic sore throat is common among the young.

The birth-rate is a little over twenty per thousand; the death-rate, a little over seventeen per thousand; but if the deaths of those not belonging to the district, but sent to the workhouse infirmary, be deducted, the death-rate is only a little over 10·7 per thousand. Among the deaths, fourteen deaths were after seventy-three years of age, their maximum being ninety-two and their average eighty and a half years.

P.S.—The popular report concerning the comparative immunity from, and the favourable course run by phthisis in Eastchurch is quite borne out by facts.

Minster, with an interesting church dating from A.D. 606, is an unlimited field for the geologist, seven hundred different examples having been unearthed on the sea shore.

#### SHEERNESS AND QUEENBOROUGH (ISLE OF SHEPPEY).

Sheerness (14,300 inhabitants), a rather depressing town, showing more signs of past prosperity than of present enterprise, lies perfectly flat, little above the sea-level, principally on reclaimed ground. It has good bathing on a very good beach of shingle and

sand extending for some distance. The "sea wall" is provided with shelters, &c., and is one and a half to two miles in length.

Queenborough (1000 inhabitants), practically one street, is a very old fishing town, boasting of a Mayor and Corporation, of a constant water supply, and gas supply, and of two factories. It has its own railway station, in addition to a special station for Flushing passengers.

*The local prevalence of, or immunity from, diseases—by Charles Arrol, Esq., M.D., &c., Medical Officer of Health for Sheerness.*

A. *Anæmia* and Debility: Rare. Climate beneficial, small rainfall.

B. *Scrofula* and Tuberculous Diseases, except Phthisis Pulmonalis: Almost unknown.

C. *Diseases of the Respiratory Organs*. Phthisis: Uncommon. In 1889 eighteen deaths. Bronchitis and Catarrh, Pneumonia, Pleurisy, and Asthma. Uncommon.

D. *Renal Diseases*. Acute Renal Dropsy: Rare. Chronic Albuminuria: Rare. Calculus and Gravel: Unknown.

E. *Rheumatism, Rheumatoid Arthritis, and Neuralgia*. Rare.

F. *Diseases of the Skin, particularly Eczema*. Rare.

G. *Endemic Diseases*. Malarial Affections: frequent but of mild nature. Typhoid Fever: In 1890 ten cases reported. Diarrhœa: Uncommon. Scarlet Fever: Rare. Diphtheria: Almost unknown. Endemic Sore Throat: Rare.

The common causes of death, and frequency of old age, among the permanent residents furnish nothing special to note. Old age is common.

The system of drainage is by gravitation, with flushing from the sea at low water.

The water supply is good: 9 degrees of hardness. Supply: 20 gallons per head.

#### WHITSTABLE.

The following notes are contributed by J. W. Hayward, Esq., M.R.C.S.Eng., &c.:—

"The so-called town of Whitstable really consists of two parishes, viz., Whitstable and Seasalter, of which the former is three or four times larger than the other; the two parishes being so intermingled that the boundaries are always perplexing to outsiders.



Although the population of the two is probably not far short of seven thousand, there is no local authority, but they are under the control and management of the Blean Union only."

"Whitstable lies six miles to the north of Canterbury, on a bay at the entrance to the river Swale, bounded on the north-west by the Isle of Sheppey. It has a northern exposure. Its mean elevation is about twenty feet above sea-level; on the coast line are cliffs of moderate height. Inland a range of hills south of the town, extending to Canterbury, over 200 feet in height."

"The soil is London clay; the cliffs are rich in iron pyrites. It is an old-fashioned town<sup>1</sup> of varied architecture arranged about one wide arterial high-street. The suburb Tankerton lies half a mile to the east of the town of Whitstable. The Tankerton estate is laid out as a health and pleasure resort with promenade on the Tankerton cliff, and shrubberies and gardens.

"Whitstable is bordered to the south by a belt of extensive and, in parts, well-timbered woods, part of the Ancient "Forest of the Blean."

"A shingle beach extends along a distance of from three to four miles. The harbour, belonging to the South Eastern Railway Company, was opened in 1829. Whitstable boasts of about a hundred fishing and oyster dredging boats; about 300 colliers; and a number of centreboard pleasure yachts, with rowing boats."

**Meteorology.**—Air clear and bracing, sunshine above the average, south-west winds prevail. Storms are below the average. The rainfall ranges about eighteen inches. Snows and frosts not of long duration. The spring winds are chiefly easterly.

**Vegetation.**—The harvest is early, the land is excellent for the cultivation of wheat. Roses flourish, also the euonymus tamarix, everlasting oak, sycamore, elm, &c., generally hardy plants grow well.

*The local prevalence of, or immunity from, diseases—by J. W. Hayward Esq. M.R.C.S.Eng. &c.*

**I. A. Anæmia and Debility.**—Found most frequently amongst young girls who are employed in dressmaking or millinery; patients suffering thus and coming here for change usually improve rapidly.

<sup>1</sup> The ancient company of the Free Fishers and Dredgers of Whitstable was incorporated by royal charter in 1793.

B. *Scrofula and Tuberculous Diseases, except Phthisis Pulmonalis*.—The average is low: children sent from towns with such diseases usually derive much benefit.

C. *Diseases of the Respiratory Organs*:—*Phthisis* (with special reference to hæmoptysis). The proportion of phthisical patients is not above the average, although the prevalent intermarriages of the residents, who are in very many cases nearly related, appears calculated to increase such a tendency. The climate is favourable for phthisis during the summer and early autumn months, but at other times the clay soil and the exposure to cold north-east winds are not suitable. Hæmoptysis not at all frequent. *Bronchitis and Catarrh*.—Bronchitis not unduly prevalent: catarrh, in winter and early spring, probably is. *Pneumonia and Pleurisy*.—Neither very frequent. *Asthma*.—I have met with a great many cases, more especially in the low-lying parts of the town, but in many instances such patients have been much benefited—and in some cases have entirely lost the disease by removal to a higher situation.

I have found patients coming from other towns or relaxing places greatly benefited by a sojourn here.

D. *Renal Diseases*:—*Acute Renal Dropsy*.—Rare. *Chronic Albuminuria*.—Not a large proportion of such cases, probably in about half the number associated with granular kidney. *Calculus and Gravel*.—Decidedly rare.

E. *Rheumatism, Rheumatoid Arthritis and Neuralgia*.—Not unusually prevalent.

F. *Diseases of the Skin, particularly Eczema*.—Not very prevalent.

G. *Endemic Diseases*:—*Malarial Affections*.—Ague, which used to be very prevalent, is now—probably owing to improved drainage—rare. *Typhoid Fever*.—Very few cases. *Diarrhoea*.—Below the average and the cases generally very amenable to treatment. *Scarlet Fever*.—Cases are usually introduced from surrounding districts or other parts, but as a rule the epidemics are not of a malignant type and do not last long. *Diphtheria*.—Sporadic cases occasionally occur, but I do not remember any severe outbreak. *Endemic Sore Throat*.—This is sometimes rather prevalent during foggy weather but not at other times.



## II. In a total number of 310 deaths:—

38	were from	heart disease.
14	„	liver.
23	„	brain.
11	„	kidney and bladder.
16	„	old age.
18	„	immaturity.
37	„	tubercle of lung.
16	„	tubercle of other parts.
10	„	whooping-cough.
10	„	bronchitis.
19	„	pneumonia.
5	„	diphtheria.
4	„	scarlet fever.

the remainder being returned from malignant diseases, apoplexy, emphysema, measles, syphilis, convulsions, &c. &c.

III. The drainage now consists entirely of sewers which discharge their contents at a distance beyond the harbour.

IV. The water supply is principally derived from two artesian wells, which are four hundred feet deep, passing through a stratum of chalk into greensand: some of the smaller houses, however, still use their own small wells, the water in the latter is usually very hard and in many cases brackish; that supplied from the artesian wells by the Water Company has been pronounced to be satisfactory on analysis.

HERNE BAY AND DISTRICT.<sup>1</sup>

Herne Bay is situated on the east coast of England and directly fronts the north, being open to the breezes that come in unrestricted from the German Ocean.<sup>2</sup> Its geological formation may be described as on the London clay, while about a mile eastward of the town the strata that are uppermost are the Thanet sands, and beyond them uppermost is the chalk. The configuration of the town itself is flat, being only a few feet above the sea level, but eastward, westward and southward there is a pleasant stretch of undulating country; that to the south being well wooded for miles.<sup>3</sup>

<sup>1</sup> From the pen of Mr. J. Watkinson, Editor of the *Herne Bay Press*.

<sup>2</sup> There does not appear to be much shelter from wind, either on the beach or on the hills, according to Mr. H. L. Albert, F.R.C.S., who has kindly contributed a few notes.

<sup>3</sup> Landslips are common occurrences, but they are very gradual. (H. L. Albert.)

Meteorologically Herne Bay is situated within the area of the least rainfall in England. The climate is bracing and the winter temperature moderated by the prevailing southerly winds, while the amount of sunshine is far above the average. The vegetation is abundant, but not otherwise notable. Of land fogs there is an entire absence, and sea mists only visit the shore occasionally in the autumn. Its seasons are genial in the spring, warm in summer and autumn, but in February oftentimes very sharp through the coming of keen north-easterly winds. The harvest ordinarily is late, and produce generally partakes of the same character in its ripening.

The resident population of the town in 1891 was 3,825, which is increased to four or five times that total during the season, which extends from June to October. The town architecturally has no buildings worthy of comment, but wears an aspect of quiet respectability, with shops of far more imposing appearance than are usually found in towns of similar size.

The local affairs are governed by a Local Board. The drainage has been during the past few years newly constructed, and is in excellent condition. The roads and streets are good, well paved and well lighted. The beach is of shingle, alongside of which is a continuous broad asphalted parade, extending along the entire front of the town. The pier is a light iron structure, with a pavilion at the south end used as a concert room. For bathing there is one of the largest covered salt-water baths in the kingdom, and safe bathing from the shore in well-appointed machines at both ends of the town.<sup>1</sup> The roads for miles round are good and present every facility for riding and bicycling, as there are no hills of any material height to compass.

The scholastic advantages are excellent, as within its confines are several high class boarding schools, for both boys and girls, which are admirably arranged; a Board School also exists. A Cottage Hospital is in good working order, and a hospital for infectious diseases is outside the town limits.

The air is dry and bracing, and is stated to have been found of much service in cases of asthma. Specially noticeable is the great age attained by numbers of the natives.

<sup>1</sup> The absence of any cliffs is an element of safety in the case of children. (H. L. Albert.)



The system of drainage is arterial with an outfall into the sea (at half-ebb tide) at the extreme easternmost limit of the town.

The water supply is constant and of a very good character, though not entirely free from hardness.

#### THE ISLE OF THANET.<sup>1</sup>

**I. Definition of the District.**—Thanet enjoys the title of island by courtesy only. Towards the west it has long been continuous with the mainland across the tract of the ancient ship channel, which once conveyed Roman galleys and Vikings from Reculver and down the Stour to Sandwich and Pegwell Bay, but the dried bed of which now forms a purely imaginary limit. Nevertheless, on this side also the leading feature of Thanet is preserved, that of being swept by every wind; for its surface rises to a higher level than that of the entire plain down to Canterbury.

Thanet is practically a huge block of chalk, surrounded by the sea on three sides, and isolated from the mainland on the west by an extensive alluvial plain, the valley of the Stour. Although at a greater depth chalk is the uniform foundation common to the whole, yet both as regards the soil itself and in respect of altitude also, two districts are very sharply marked off, the cliff and the lowland.

The upland of Thanet comprises Ramsgate, Margate, Broadstairs, and the inland district of St. Peter's. At a lower elevation Westgate-on-Sea and Birchington may be classed as intermediate. And to the lowland are to be reckoned, on the north coast, the district of Reculver; on the south coast, the district of Pegwell, Chilton, Little and Great Cliff's End; whilst inland, Minster, Monkton, Sarre, and St. Nicholas-at-Wade belong to the valley of the Stour.<sup>2</sup>

The chief towns in Thanet are all built close to the sea, and are distributed between the three shores of the island. Margate, with its satellite Westgate, and Birchington are arranged along the north

<sup>1</sup> In the preparation of this Report I have received material assistance, and the help of valuable suggestions, from my friend Dr. R. H. Clarke, of Westwood, Thanet, to whom I desire to acknowledge my indebtedness and to offer my thanks.

<sup>2</sup> None of these places are of much importance as residential centres or health resorts. The consideration of their climate may be taken together with that of the east coast opposite the Downs.

coast; Broadstairs occupies a small bay at the foot of the picturesque eastern slope; and Ramsgate, which crowns the south-east angle of Thanet between its eastern and southern shores, presents greater variety of aspect and of climate than any of the other towns.

**II. General Physical Characters and Configuration; Superficial Geology, and Vegetation.**—Any one driving through Kent towards the east must be struck by the change in the character of the country after leaving Charing or Ashford. The vegetation, hitherto luxuriant, becomes far less abundant; there are fewer trees; the hedges are stunted; corn, if standing, is much shorter in the stalk; and ponds and streams are rare. Altogether there is a somewhat barren appearance, which indicates a chalk soil, and a relative want of water. This dryness of soil occurring in our elsewhere damp climate is in itself remarkable. With few exceptions it prevails throughout East Kent; but nowhere is it so well marked as after we have crossed the broad valley of the Stour, which is continued northwards into that of the Channel. The superficial geology of Thanet, which together with its exposed position explains these peculiarities, can be described in very few words. The valleys just mentioned are both verdant and in places almost marshy, with an alluvial soil; but beyond them the rising ground consists entirely of chalk, hardly ever covered with more than a foot or two of earth, and the soil may be regarded almost as the driest in England.

**III. Climatology. Temperature.**—The thermometric observations taken at Ramsgate and Margate agree so closely, in spite of minor differences, that we may take the mean between them as a fairly correct expression of the values for Thanet in general. We find  $39.0^{\circ}$  as the mean for the coldest month (January), and  $61.3^{\circ}$  as the mean for the warmest month (July); the mean temperature for the year being  $49.25^{\circ}$ . These values are almost identical with those obtained at Worthing, slightly higher than those obtained at Southampton, and slightly lower than those from Ventnor, where the winter months always show a higher mean. For this near approach to uniformity, in spite of differences in latitude and especially in exposure, the most probable explanation is the operation of some modifying agent, such as the temperature of the sea, common to the districts we have mentioned.

The main conclusion that the mild climate of Thanet is due to



the influence of the Gulf Stream is based upon the following facts:—(1) The great contrast between the Thanet sea-temperatures and air-temperatures with those of regions of the same latitude not bathed by the Gulf Stream. (2) The almost complete uniformity between the readings taken at the Royal Sovereign and the East Goodwin lightships respectively, coupled with the identical mean temperatures of the air obtained in Thanet and at Worthing. (3) The fact that, whilst equality in temperature exists between the Brighton waters and those of Kent and Suffolk almost as far as latitude  $52^{\circ}$  north, beyond this latitude the sea becomes decidedly cooler. In short, the North Kent and East Kent coasts enjoy almost the full advantage bestowed by the Gulf Stream on the south coast stations, situated at the east end of the Channel; and in this respect they are favoured beyond any other portion of the east coast of Great Britain.

In connection with the question of the influence of ocean currents and of the temperature of the sea, the following facts may be of interest as specially concerning Thanet:—

(1) The surface temperature of the sea at the East Goodwin L.V. grows from a minimum ( $42^{\circ}$  in January), at first gradually, and from May onwards with rapid strides, to  $61^{\circ}$ , the maximum in August and September. The record shows a fall of four degrees for October ( $57^{\circ}$ ), of five degrees for November ( $52^{\circ}$ ), of three degrees for December ( $49^{\circ}$ ), and of seven degrees for January ( $42^{\circ}$ ).

(2) If we refer for comparison to an extreme south-westerly station in England, the surface temperature at the East Goodwin L.V. is found to be identical with that off the Scilly Islands only in August and in November; it exceeds the latter by two degrees in September, and by one degree in October; it is two degrees lower in June, July, and December; three degrees lower in May; four degrees lower in March and April; six degrees lower in February, and seven degrees lower in January.

(3) If, on the other hand, comparison be made with the surface temperatures at the neighbouring meteorological stations north and south, the readings at the East Goodwin L.V. exceed those at the South Foreland in March, April, May, and December; but are inferior to them by about two degrees during the summer months and in January and February. And the surface temperature at the East Goodwin L.V. is slightly exceeded by the temperature at the

northerly station only in January, July, August, and October, being warmer than the latter during the remainder of the year. During April, May, and December it is warmer, and during January, August, and October it is colder, than that at both adjoining stations.

From the facts which have been enumerated, and from others set forth in the Meteorological Atlas, we may infer :

(1) That the difference between the readings of the surface temperature of the sea along the north coast and the east coast of Great Britain and those along the east and south-east coasts of Thanet, respectively, is to the advantage of the latter.

(2) That the higher surface temperature of the sea at the region of the East Goodwin L.V. in March, April, and May probably favours the climate of Thanet, and perhaps of the East Kentish coast, in a direct manner, however slight, inasmuch as it is precisely during that period that easterly winds off the sea prevail. This point may be deserving of further study in the future. Although it is difficult to trace the phenomena to their individual causes, the variations observed at the three coast stations included between latitude N.  $51^{\circ}$  and  $52^{\circ}$ , presumably arise from the intermittent influence of colder currents. The cessation of this cooling influence, at seasons when the temperature of the European extremity of the Gulf Stream is still being depressed by Atlantic icebergs, probably explains the apparent anomaly of higher readings at the Goodwin than at Scilly in July. The slight depth of the Channel waters is perhaps a still more important factor in this respect.

Without greatly multiplied observations it would be impossible to say whether the slight local variations mentioned affect differentially the climates of the three coasts of Thanet.

*Altitude.*—Though the elevation above the sea (180 feet) is slight, it secures for Thanet some of the advantages usually dependent upon higher altitude, because there is nothing approaching this height for many miles in any direction.

*The Relative Humidity and the Rainfall.*—The yearly mean of relative humidity of the air shows for Margate and Ramsgate, and therefore we may conclude for Thanet, a percentage of 82. It has already been suggested that the large extent of inland chalk has a certain influence in lessening the moisture of the air



which subsequently traverses Thanet. Often in threatening weather, heavy black clouds coming up from the east gradually melt and disperse as they pass over the island, whilst a little farther south, over Sandwich and Deal, it may be raining heavily.

*Rainfall.*—Although in the progress of an Atlantic storm Thanet is the last district visited in England, still the rainfall is not insignificant. The map of the rainfall for the whole year (Meteorological Atlas, Plate XXVII), based on observations taken during fifteen years from 1866–1880, shows for Thanet a rainfall of twenty-five inches. This is less than is observed in any part of Kent or in other districts farther south or farther west. Indeed an equally small rainfall is observed only at the mouth of the Thames; along narrow strips of the East Anglian coast; over an inland area extending from Cambridge to the Humber, and at the Moray Firth; it is exactly half as abundant as that prevailing on the south-west of Ireland, and over a portion of the north-western Cornish coast; it is five inches less abundant than that observed along the eastern Kentish coast; and ten inches less abundant than that between Dover and Folkestone.

In Thanet it is a common observation that, though rain may fall at times heavily, the air will preserve its dryness in spite of the rain. The unnerving steamy dampness which so often follows excessive rain on a summer's day, is hardly known in Thanet, and owing to the rapid drying of the soil, especially in summer, the invalid can generally walk out, without risk from the air or from the ground, a few minutes after a heavy downpour.

*Fogs* are by no means rare; but after what has been stated it is hardly necessary to add that they do not arise from a damp soil, but from the sea, the temperature of which remains relatively warm throughout the winter, whilst that of the air is subject to abrupt depressions.

*Winds.*—The relative prevalence of the several winds is given in detail under the heading "Special Climatology of Margate." It will be observed that only thirty-eight days in the year are described as calm. The list of winds is headed by the south-west with eighty-one days. The west and the east winds are about equal with forty-nine and fifty respectively, and their frequency is approached by that of the south wind (forty-five). The other

winds—north, north-east, south-east, and north-west—range between the values thirty-two and twenty.

Any spot in the east of the island may be selected for the sake of its bracing qualities: there is no part which is in any way relaxing. The scattered clumps of wood planted around habitations in shallow depressions of the ground, together with the stunted and bent growth of the outer line of these stockades, inform us at a glance that protection, not ventilation, has been the need felt by successive generations of inhabitants. If on a boisterous day we step into one of these refuges, we realize at once their object and their efficiency, and on going forth from their pleasant shelter we are met again in one or in the other direction by the bracing breezes blowing from one of the three seas, or from the Canterbury plain. For even the land wind, undiminished in its strength owing to the flatness of the intervening country, acquires from the chalky surface over which it travels a drier character than is common to westerly and south-westerly winds in these Isles, and it is not relaxing. In short, the almost insular position, the comparative absence of vegetation, and the scarcity of trees allow the freest possible circulation of air, which is commonly off the sea.

*Sunshine.*—There results from the prevailing flatness of the plateau another great advantage: from most parts of its surface the sun can be followed from its earliest to its latest steps. Sunshine in Thanet co-operates powerfully with climate; the sky, whenever clouds are absent, is radiant with light.

*Vegetation.*—For the successful growing of the more tender indigenous plants, just as for the health of invalids, all that is needed is protection from wind. In plantations the outer trees suffer, those which are protected grow luxuriantly. Thanet rejoices in excellent crops because of the milder weather and of the brilliant warmth prevailing in summer, associated with conditions of soil favourable to the growth of cereals. Subtropical vegetation is not attempted.

#### **Climatic Capabilities of Thanet and the Differential Climatology of its Resorts.**

Thanet presents the valuable climatic advantage of a dry stimulating and bracing atmosphere in a temperate zone. Thus, with



the aid of artificial protection, it might be capable of fulfilling a considerable range of different climatic requirements. This advantage has not been actively utilized on any systematic plan. But nature herself has led the way in providing shelter in some of the most sunny situations. Thus whilst the greater part of the surface of the island in its eastern portion may be compared to the deck of a ship, swept by every wind from the sea, at Broadstairs, at Ramsgate, and at a few favoured spots on the high ground, guarded by dense and thick walls of evergreen trees and shrubs, the sunshine and outer air may be enjoyed in safety even by invalids.

Were this small but healthgiving island the only available sanatorium for London convalescents, considerable care would doubtless be bestowed upon the selection, for each individual case, of the best local climate. Hitherto, however, the number of cases sent for treatment has been relatively small, and they have belonged to groups for which the climate of Thanet in general was so well fitted as to render discrimination between the several localities almost superfluous.

In the future this range of usefulness may be much extended, especially in the direction of pulmonary disease; and, in that event, the differential climatology of the district must sooner or later claim closer attention.

*The Therapeutical Indications and Contra-indications with reference to Thanet in general.*

(a) *The Indications.*—The conditions likely to receive great benefit are the following:—

- (1) Debility, so long as it does not amount to exhaustion; and, with the same reservation, convalescence from any disease.
- (2) Common Anæmia. On the subject of Pernicious Anæmia evidence is still wanting.
- (3) Scrofulous affections.
- (4) Most pulmonary affections, and pre-eminently those of childhood. Asthma can only be sent to Thanet tentatively.
- (5) Early Phthisis, with the understanding that due shelter from wind is provided.
- (6) Malaria. The higher parts of Margate are especially useful in cases of long-standing (Indian) malarious disease.
- (7) Various nervous affections and constitutional states dis-

tinguished by depression and torpor, rather than by undue excitability. (8) Dyspepsia based upon debility.

(b) *The Contra-indications.*—The general contra-indications common to all seaside resorts apply to Thanet in an exaggerated degree. On the other hand the special objections based upon the exposed situation of the district may have been over-estimated, and it is possible that the number of contra-indications may be further reduced in the future. For the present the following may be regarded as unsuitable:—

(1) Cases of extreme debility. (2) Cases of advanced phthisis (except during the summer). Whether hæmoptysis is or is not a contra-indication must be still regarded as an open question. (3) Cases of irritability of the nervous system and of insomnia due to this cause. (4) Congestive affections of the alimentary tract. (5) Rheumatism and Gout. (6) Acute renal disease. (The anæmia of chronic renal disease would probably derive benefit from a summer residence.) (7) Diseases of the skin allied to eczema, and in general all such as are not dependent on scrofula.

#### THE DIFFERENTIAL MEDICAL CLIMATOLOGY OF THE THANET RESORTS.

All the stations agree in the possession of certain general properties, to which we need not again refer; but we may roughly divide the stations into the four following sets:—

(1) The northerly stations, Margate, Westgate, and Birchington.

(2) The easterly station, Broadstairs.

(3) The south-easterly station, Ramsgate.

(4) The plateau stations represented by St. Peter's.

The northerly stations differ from the others in their slightly lower temperature. Margate contrasts with the two other towns having the same aspect in possessing a choice of altitudes from the sea level up to a relatively important elevation. In its lower part it enjoys comparative shelter from the south and from the east winds. In its highest part it partakes of the climate of the Thanet plateau.

Westgate and Birchington, built on lower cliffs and lacking at



the back the protection of higher ground, are more or less draughty. Hitherto they have been visited chiefly as summer resorts.

Broadstairs facing east, and exposed to the inroads of the east wind, is to a certain extent protected from the north, and to a great extent also from the west and from the south. It is excellent as a summer resort, but it enjoys sufficient protection in most of its sites to claim advantages also as a winter residence for suitable cases; and it has been used as such with success.

Ramsgate facing south-east and south is protected from the north, from the east, and from the west; and though less bracing than the other stations, it has over them the advantage of rather more warmth and more sunshine.

St. Peters is the only inland centre belonging to the plateau of Thanet, of which it does not, however, occupy the highest level. Its relative protection from wind is due partly to the further rise of the ground beyond it towards the west and towards the north, and partly to the plantations of trees which add to its picturesque features.

The plateau itself presents only scattered habitations, some of which however occupy sites rendered eligible by natural depressions in the ground, or by the artificial protection of tree plantations.

*Ramsgate and Margate.*—For the greater number of intending visitors the choice lies between Margate and Ramsgate, though Broadstairs is likely to compete with them more and more in the future. In the possession of a strongly bracing atmosphere Margate is perhaps unrivalled. Still a very near imitation of "Margate air" can probably be got at Ramsgate. At any rate it may be obtained by a moderate walk up to some exposed part of the plateau. But the protection from the colder winds which is found at Ramsgate, does not exist in the neighbouring resort; neither does the latter possess the advantage of an aspect towards a southern sea. Thus the climatic capabilities of Ramsgate extend towards varieties and stages of disease for which the breeze from the north might be overpowering. But even at Ramsgate the line would have to be drawn against a large number of the more delicate patients, unless the circumstances of their residence were specially good, both as regards the particular site and aspect of

their habitation, and their facilities for frequent medical supervision and advice.

It cannot be denied that in July, August, and September the numbers and the class of visitors who frequent Margate and Ramsgate must be objectionable to refined and quiet people. This should not exclude invalids from obtaining the benefits of the climate. In the past the objection has not proved insuperable, for it is notorious that an important proportion of the residents, both in the towns and on the plateau, have originally settled in Thanet on account of health. Indeed, except during the three months mentioned, these places are quiet enough. Moreover, in the summer months, and for people who can bear it at all times, the best climate is probably not to be found in Broadstairs, in Ramsgate, or in Margate, but further inland at a higher level, where residences stand within their own grounds, and are screened by shrubberies and surrounded by fields.

Hyperventilation attains such a degree in Thanet that nothing short of gross overcrowding, or of obstruction by buildings of phenomenal height, such as are now threatening the health of London, could conceivably deprive its air of its health-giving properties. In this respect it presents a conspicuous difference with the Alpine altitude resorts for phthisis, where the prevailing stillness of air renders overcrowding an appreciable danger. There is therefore no sanitary objection to the utilization on a very large scale of the climatic advantages of the district. It is impossible to assign a limit to the spontaneous growth in the popularity and in the population of Thanet likely to occur when its advantages shall have become better known. Fortunately its not improbable conversion into an extensive health-station may be regarded with equanimity not only by the sanitarian but by the artist also, for there is little to spoil, beyond the lovely sunsets, in the scenery of the island. The soil is fertile, but the value of its crops could bear no comparison with that of the many lives which it might be utilized in restoring to health and to usefulness.

In conclusion, Thanet may be said to owe its climatic virtues to the atmospheric influences from the wind and from the sea, to the warmth of the Gulf-stream, to its chalky soil, to its brightness of sky and sunlight, and to its moderate altitude. Wind, which



is foremost among these advantages, is also that agent which requires most consideration and management, especially the east winds of spring. Thanet cannot on this account be considered a suitable spring residence for advanced phthisis, nor for any of the respiratory diseases characterised by great irritability. With these exceptions it is wonderful how well pulmonary cases do as a rule. Both Ramsgate and Broadstairs have admirable winter climates for most invalids; and many are so fortified by a winter residence as to be able to meet the spring winds without risk.

*Summary of the Answers to the Society's Circular received from Members of the Medical Profession residing in Thanet on the Prevalence of, or Immunity from, Diseases in the Island of Thanet, and the Therapeutic Effects of the Climate, with Indications as to its Use in Particular Diseases.*

The essential agreement between the Medical Reports received from separate localities in Thanet allows them to be summarised. Any local divergences from the general conclusions have been noticed in the special reports.

(a) Anæmia is stated to be benefited in a marked degree, especially among visitors; and its occurrence among them, *de novo*, is unusual. On the other hand, absolute immunity is not afforded to those among the residents (especially females) who are over-worked and kept indoors.

(b) Scrofula and tuberculous diseases are described as rare among residents, and treated with very great success in imported cases. Cases occurring among residents are often traceable to hereditary influence, the parents having settled in Thanet for their own benefit.

(c) Almost without exception the reports testify to the infrequency of phthisis among residents, and to its successful climatic treatment in visitors during a great part of the year. Hæmoptysis is held to be a contra-indication at some of the resorts, less so at others.

On the subject of bronchitis and catarrh individual reports show considerable divergence of opinion. It is noteworthy that the climate of one of the northerly stations (Westgate) is described

as specially beneficial to chronic bronchitis and emphysema during the winter.

Pneumonia and pleurisy are both described as uncommon. Only one observer has noted the occasional prevalence of pneumonia in an epidemic form (at Broadstairs).

Spasmodic asthma does not appear to be prevalent among residents. Among visitors the effects of the climate vary in individual cases.

(d) Acute renal dropsy, including the post scarlatinal form, is regarded as rare by all observers. Chronic albuminuria, though less rare, is, according to most reports, not commonly met with among residents. The climate is not regarded as specially adapted for its treatment.

Calculus is declared to be "very uncommon," "exceedingly rare," or "unknown" among residents. Gravel is also stated to be uncommon; one observer, however, regards lithiasis as prevailing somewhat above the average.

(e) Acute articular rheumatism would appear to be uncommon among residents; the sub-acute form less uncommon. Muscular rheumatism is rather prevalent, at least at one of the northerly stations. Concerning rheumatoid arthritis further evidence is required both as regards frequency and reaction to climate.

Neuralgiæ are admitted to be rather prevalent, or not uncommon; this is not, however, a unanimous opinion.

Cutaneous diseases are not regarded as specially suited for climatic treatment in Thanet. Nevertheless good results are reported in some imported cases. Among residents eczema appears to be fairly common; other cutaneous affections unusual.

(g) Malaria is unknown, and convalescents from Indian fevers visiting Thanet do remarkably well. Typhoid fever is very uncommon, or even rare, owing to improved sanitation. Summer diarrhoea is now less common, but still prevails among the visitors. Scarlet fever is not endemic, but in most cases traceable to importation. Common tonsillitis is not infrequent in connection with certain changes in the weather. Diphtheria is rare.

The prevalent causes of death appear to be old age and the diseases of infancy. There is good evidence that longevity is of frequent occurrence.

The drainage of the towns is described in the local reports.



Hitherto no artificial drainage has been used in the case of the separate residences in the country. The porous nature of the chalk has rendered this unnecessary. Cesspools cut in the chalk act as filters, at least for a time, and when they cease to act fresh ones are put into use. So long as the population remains scanty this primitive method is probably not fraught with any danger.

The water throughout Thanet is chalky, but otherwise pure.

Among the observations, a summary of which has been given, the most important are those illustrating the value of the climate for all states of debility, including early phthisis, and the total immunity from malaria. Formerly malaria was known to exist in the neighbourhood of Reculver and even of Westgate, and in the low-lying alluvial district of Pegwell Bay; but even there it is hardly met with nowadays. The rarity of calculus, the infrequency of acute renal dropsy, and the infrequency of acute rheumatic arthritis are dwelt on in all the medical reports. It is the more to be regretted that there are no readily accessible statistics dealing with the incidence of these diseases in Thanet, as the Registrar-General's Report (*vide infra*) shows that the mortality from these diseases, in Kent as a whole, is not materially different from that in England and Wales. It is conceivable that sea-coast influences may exert some restraining action in these directions. Hitherto we have no proof for or against this view; but the statements which we do possess are well worthy to be remembered as indicating lines of research for future observers.

The positive observations recorded in connection with the relative frequency of the chronic and of the muscular forms of rheumatism and of the neuralgiæ are conclusive, and need no comment.

#### **Statistical Data as to the Mortality from Various Causes in Thanet.**

*Annual Report for 1891, by the Medical Officer of Health for the Thanet Rural Sanitary District.*<sup>1</sup>—During the year ending December 31, 1891, a birth-rate of 26·6 and a death-rate, after correction for the mortality of urban subjects in the workhouse, of 14·6 per 1,000 were registered.

<sup>1</sup> From Dr. M. K. Robinson's *Report to the Sanitary Authorities of the East Kent Joint Committee for 1891*.

13 deaths occurred from phthisis, 36 were referred to diseases of the lungs, 12 to heart disease, 4 to injuries, 3 to whooping-cough, 1 each to measles and diarrhœa, and the remaining 124 to old age and various other causes.

The zymotic death-rate was equivalent to 0·5 per 1,000 of the population.

Infant mortality was high, being equal to 16·0 per cent. of the births, whooping and lung diseases being the prominent factors which contributed to this result.

*The Prevalence of, or Immunity from, Diseases in Thanet, as estimated from the Tables of Mortality of the Registrar-General.*

In the case of some of the diseases it has been possible to check, by means of the mortality returns of the Registrar-General, the opinions which have been recorded with regard to the local incidence of diseases in the sanitary districts. In the case of other diseases this has only been possible in connection with the counties. Thus with regard to calculus, the mortality for the county of Kent is only slightly below that for England and Wales, but the values for Thanet are not given. Judging them to be analogous to those for Kent in general, the mortality from this cause would amount to something between 0·7 and 0·8 for 100,000 persons living—and the occurrence of the disease as observed during life would presumably partake of the same rarity. In the same way rheumatism, gout, acute nephritis, chronic albuminuria, &c., do not form the subject of a general report for the sanitary districts, but for the counties only.

The following values for Thanet appear in the supplement to the forty-fifth annual report of the Registrar-General, and are based on the figures for the ten years 1871–1880.

The general death-rate for Thanet (18·97 per 1,000) does not compare favourably with that for Kent (extra-metropolitan) (17·81 per 1,000) (the death-rate for England and Wales being 21·27 per 1,000).

The mortality from cancer is shown to be 0·66 per 1,000, against 0·48 for Kent and 0·47 for England and Wales.

The mortality from scrofula 0·27, against 0·13 for Kent and also for England and Wales.



The mortality from phthisis is 1·70 for Thanet, against 1·83 for Kent and 2·12 for England and Wales.

The mortality from diseases of the respiratory system is 2·64 for Thanet, against 2·82 for Kent and 3·76 for England and Wales.

And, lastly, the mortality from diseases of the urinary system is 0·48 for Thanet, against 0·41 for Kent and 0·39 for England and Wales.

Thus it is seen that Thanet does not enjoy absolute immunity from any of the diseases enumerated. Concerning phthisis and especially scrofula, sufferers from which are sent into Thanet for their health, we are left in doubt how many of the deaths were those of imported cases. The distinction is drawn in the reports of the medical officers of health for the several towns.

The same reservation does not apply with equal force to cancer and to diseases of the urinary organs: for these affections residence in Thanet is not so commonly recommended. Both show a markedly higher mortality than that belonging to Kent and to the rest of England.

#### BIRCHINGTON.

(For the particulars relating to Birchington the reporter is indebted to Mr. J. Smith Harris, L.R.C.P.I., M.R.C.S.Eng., Medical Officer of the Minster district, and of the Workhouse of the Isle of Thanet Union.)

THE district of Birchington may be described as undulating, destitute of trees, and very exposed to wind. The land is chiefly used for corn growing and general agricultural produce, hops, beans, peas, &c. A rich loamy soil covers the chalk, which maintains it very dry.

The coast line is formed of chalk cliffs, ranging from twenty to forty feet in height, with a sandy beach.

*The Climate* is dry, windy, cold, and bracing, with an equable temperature. The prevailing winds blow from the north-east and south-west. There is a fair amount of sunshine and a relatively small rainfall and little fog. The characters of the climate vary slightly in different seasons. In spring it is dry, with cold winds (especially from the east). In summer it is usually dry and bright and windy. In autumn it is fine, mild, and dry. In winter it is dry, with little rain or snow.

The drainage is into cesspools cut in the chalk and is satisfactory. The water supply is abundant; it is derived from the Westgate waterworks.

The climate has a very beneficial action upon tuberculous and scrofulous patients and upon all diseases requiring bracing air.

**The Local Prevalence of, or Immunity from, Diseases.**

*Anæmia and Debility* are rarely seen among residents, and quickly get well.

*Scrofula and Tuberculous Diseases* are also rare, and quickly get well.

*Diseases of the Respiratory Organs*:—Phthisis and hæmoptysis are rare. Bronchitis and catarrh not common, except in old age. Pneumonia, pleurisy, and asthma are very rare.

*Acute Renal Dropsy and Chronic Albuminuria* are very rare: Mr. Harris has never had a case. Calculus and gravel, very uncommon.

*Rheumatism, Rheumatoid Arthritis and Neuralgia*:—Mr. Harris only attended two cases of acute rheumatism in ten years. Neuralgia is not common.

*Diseases of the Skin*, particularly eczema, are prevalent.

*Endemic Diseases*:—Malarial affections are unknown.

Typhoid fever. In Mr. Harris's practice there was not one case for three years. Diarrhœa is not so prevalent as in other places.

Scarlet fever occurs occasionally, but does well; very few cases are severe. Diphtheria: only one case was observed in ten years. Endemic sore throat: only a few cases occasionally.

The common causes of death among the permanent residents are old age, cancer, and failure of the digestive organs. Many attain a considerable age.

**WESTGATE-ON-SEA.**

A small town of modern foundation, originally intended and hitherto exclusively developed as a seaside resort for the upper classes, Westgate possesses but a small permanent population, mainly consisting of tradespeople and lodging-house keepers.

It is situated one and a half miles from and to the west of Margate, faces north, and is not specially protected by hills in any



direction, although the higher ground of Margate and of the Thanet plateau affords some shelter from the easterly winds; but there is a progressive fall in the height of the cliffs towards the west of the island, where the land was formerly submerged and now consists of salt marshes little raised above the sea level. Westgate is partly on cliffs, but there is less of high ground or sheltering hills behind it than is the case with other resorts in Thanet, and little protection from any currents of air that may blow across the belt of low ground which connects Thanet with the mainland. This circumstance may have afforded some reason for an impression that Westgate is the coldest place on the island.

The geology resembles that of Thanet in general: chalk thinly covered with a light but fertile loam, which is deep in some few places mostly of small area.

As to general climatology, the reports for Margate will apply. No regular observations are kept except the astronomical ones made by Mr. Norman Lockyer at his observatory.

There is usually some wind stirring. Westgate is not a rainy place. It is much favoured as regards sunshine. The dryness of the soil on the day after heavy rain is very remarkable. In summer, invalids mostly prefer the sea aspect (north), or north-west; in winter, the south and south-west aspects. There is excellent sea bathing, very safe, on a sandy bottom, and the whole shore is entirely covered up to the sea wall or cliff at every tide.

**The Prevalence of, or Immunity from, Diseases, and the Effects of the Climate on the Patients.**—In the Reports received from Messrs. A. Flint, M.D., L.R.C.P.Lond., M.R.C.S.Eng., J.P., Member of the Rural Sanitary Authority, and of the Joint Hospital Committee at Northwood, and A. F. Street, M.D., &c., the following observations are specially to be noted:—

(1) Phthisis is rare among residents. Early phthisis improves and is sometimes cured. But cases associated with hæmoptysis are unsuitable. (2) One of the reporters writes:—"Chronic bronchitis with emphysema is largely benefited, especially among visitors from London in winter." (3) Acute pneumonia is rare; Dr. Flint only had three or four cases in thirteen years, and none fatal. (4) Pleurisy is not common and limited to rheumatic

subjects. (5) Acute renal dropsy does not occur, except mild scarlatinal cases. Calculus and gravel are unknown. (6) Acute rheumatism is very rare. Nothing to note concerning other cases. (7) Neuralgia is not uncommon. Among visitors the superficial neuralgiæ, and those dependent on past malaria, anæmia, overwork, and traumatism improve. (8) Eczema is also met with. One reporter writes:—"Cases originating here improve by change inland. Infantile eczema, and that of children almost always do well." The other reporter writes:—"I doubt if the climate is specially suitable." (9) Malaria is unknown now: but there is a history of malaria in bygone times.

**The Common Causes of Death among Residents.**—In a practice extending over a period of thirteen years, part of which time one of the reporters was sole practitioner, only 95 death certificates were signed. Of these, 34 referred to visitors, to whom the inquiry does not apply. Of the remaining 61 deaths 26 occurred under 1 year old; 20 over 60 years old; 15 between 1 and 60 years. Those over 60 were all caused by diseases independent of climatic influence; likewise those under one year of age which were referred to dentition, infantile atrophy, pertussis, and bronchitis. Among the deaths from convulsions several cases were of a tubercular nature.

Of the 15 deaths between the ages of 1 year and 60 years the causes are the following:—

DEATHS BETWEEN 1 YEAR AND 60 YEARS OF AGE.

Phthisis pulmonalis . . . . .	3
Endocarditis . . . . .	1
Perforating ulcer of stomach . . . . .	2
Pernicious anæmia . . . . .	1
Morbis cordis (mitral) . . . . .	1
Typhoid . . . . .	3
Diphtheria . . . . .	1
Idiocy . . . . .	1
Cirrhosis of liver (dipsomania) . . . . .	1
Empyema . . . . .	1
	—
	15

**The Drainage System.**—The prevailing system is cesspool drainage. There is mostly one cesspool to each house. There are also houses accommodated with earth closets. The low zymotic death-rate shows that we are not yet feeling the inconvenience of cesspools. "The cesspools are mostly properly disconnected



and often well ventilated, but not cemented. In many cases the cesspool is at a safe distance from the house, gardens being usual." A system of main drainage will shortly be projected, and adopted by the Kent County Council in conjunction with the future District Council.

**The Water Supply.**—There is hardly a well in the place. The water supply is pumped from a well in the chalk at a depth of 120 feet and at a distance of about a mile from the town into a small cistern. The supply is constant and plentiful, the pipes well laid, the water unusually pure as regards organic contamination, and well aerated, but of course chalky.

Appended is an analysis:—

	Grains per Gallon.
Solids . . . . .	31.5
Chlorine . . . . .	3.92
Volatile Matters . . . . .	15.4
	Parts per Million.
Free Ammonia . . . . .	0.008
Alb. Ammonia . . . . .	0.034

The watershed is in the proper direction.

## MARGATE.

*General Configuration.*—The town stands on two hills separated by the Dane Valley. The East Hill district is called Cliftonville; it is the highest part of the town. Although Margate owes much of its reputation to the advantages of a northern aspect and of a high situation, a good proportion of the town does not correspond with that description. For instance, the lower part, situated near the railway station, and behind the harbour, is not many feet above the level of the sea, though the ground rises again towards Westgate. East of the station, the coast line forms a projection northwards and the cliff rapidly acquires greater height. A rise towards the plateau of Thanet also occurs in a direction south and south-east, although more gradually. Thus the rapid slope rising from the Marine drive faces west or north-west and on this part of old Margate is built; but the high cliffs upon which the new portions of the town have spread again face north.

*Aspect and Shelter.*—The high cliffs receive the unbroken force

of the north, north-east, and north-west winds. But a great portion of the sloping surface included between them and the more gradual rise which begins south of the railway to Ramsgate, is protected from the north as well as from the east; and all parts of Margate are more or less protected from the south and the south-east by the greater height of the Thanet plateau. Margate stretches some distance away from the sea-front over undulating ground; inland therefore there are houses of all varieties of aspect, protected, according to their situation, from various points of the compass. Many of those however which are very well protected are low lying, and removed from the direct influence of the sea, and can hardly be regarded as in full enjoyment of the characteristic Margate air.

*The Margate Sands.*—The beach at low tide affords good opportunities for easy riding all the way from Birchington to Ramsgate Harbour; and almost everywhere there is plenty of room except at high water, when there is hardly any either at Margate, Ramsgate, or anywhere else. This is particularly the case east of the Margate jetty: there is but little space left uncovered at high tide, and this is utilized for the sea bathing arrangements of Cliftonville; and a great part of the surface exposed at low tide is rocky. Thus East Margate is deficient in some of the attractions and comforts connected with a free access, at all periods of tide, to a protected beach.

*General Climatology.*—At Margate the climate of Thanet is distinctly modified and takes on a more bracing and northerly type. Although many individual sites and houses are protected from the direct force of the north winds, the influence of the latter, to a certain extent, pervades the whole town. The north-westerly, north and north-east breezes also obtain ready access to most of the high stations. Neither in the town itself nor in its surroundings are there many trees. This circumstance favours, not only free ventilation, but likewise dryness of the air, which is kept up by other causes also.

The subsoil, as in Eastern Thanet generally, consists of chalk.

*Special Climatology.*—The values as regards temperature, wind, barometric pressure and humidity approach so closely to those belonging to Ramsgate that it is expedient, in order to save repetition, to give the two sets of figures side by side. Some of the



figures for Margate will therefore be found under the heading of the "Special Climatology of Ramsgate."

*Meteorological Report for 1891.*—Appended to the Report of the Medical Officer of Public Health for 1891, is an important annual meteorological Report contributed by Mr. Stokes, F.R.Met.Soc., Honorary Meteorologist to the Borough of Margate; and from this the following data have been derived.

*Wind.*—The prevailing wind is from the south-west, except in April and June. In 1891, 730 observations were made; the results are tabulated as follows:—

Calms.	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Total.
95	48	47	92	33	79	212	93	31	730

*N.B.*—An abstract, for which the Reporter is indebted to the kindness of Mr. Bertram Thornton, M.R.C.S., of meteorological observations taken twice daily during the period 1883-1890, reduced to days, shows the following record:—

Calms.	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Total.
38	32	27	50	23	45	81	49	20	365

*Humidity.*—For the period 1882-89 the mean relative humidity at 9 A.M. was for the several quarters 87; 77; and 87 respectively—and for the whole year 82. The highest 90, belongs to January—the lowest 80, to September.

*Rainfall.*—For 1891 the rainfall measured 23.93 inches, a slight excess over the average; and the days on which rain fell numbered 178, or 11 above the average. The figures for the period 1882-89 were 22.95 and 171 respectively. Margate, like the rest of Thanet, is liable to sea-fogs. Their frequency is not great.

*Barometric pressure.*—The extreme values recorded in 1891 were 30.774 and 28.570. For the period 1883-89 the mean pressure for the whole year was 29.977.

*Average daily Temperature.*—This was 48.4 for 1891, or 0.6 less than the average of 10 years (49.2).

The first quarter gave	37.4
The second " "	50.6
The third " "	59.7
The last " "	45.9

The maximum temperature in the shade exceeded 70° on 23

days but did not reach 80°. With the black bulb fully exposed to the sun 131° was the highest reading.

The average temperature for the nine years (1882-1890) was 44°·7 from October to December—(Ilfracombe 48°·1);—42°·1 from October to March—(Ilfracombe 45°·9)—55°·8 from April to September—(Ilfracombe 56°·0).

The coldest month is January, with an average temperature of 38°·9.

The daily range is smaller than that prevailing at most other stations. It amounted to 11°·5; or rather more than that recorded in 1890, which was 10°·8.

A sunshine recorder has been in use since last year only; tables are not yet available. The mean cloud values at 9 A.M. for the period 1882-89 were for the several quarters 7·2; 6·5; 6·5; 7·4; respectively:—or for the whole year 6·9.

**The Prevalence of, or Immunity from, Diseases, and the Effects of the Climate on the Patients.**—Special reports were received, in reply to the Society's Circular, from the following gentlemen, in practice at Margate: Messrs. F. E. Nichol, M.B.; George M. Pittock, M.D.Lond., M.R.C.S., L.S.A.; W. P. Price, M.D.; W. T. Rees, M.R.C.S.; Arthur W. Rowe, M.S., M.B.; R. Thomson, M.D.; Bertram Thornton, M.R.C.S.; W. K. Treves, F.R.C.S. The substance of many of the observations is given elsewhere in the summary of the Medical Reports received from Thanet. The following points only need to be stated:—

(1) Anæmia and Debility.—Only one observer remarks that there is an "average amount" of anæmia among the resident population. All others refer to it as uncommon.

(2) Scrofula and Tuberculous Diseases, except Phthisis Pulmonalis.—The climate has been deservedly noted for a century for these complaints. The benefit obtained is in some cases extraordinary. The returns of the Royal Sea Bathing Infirmary communicated by the Resident Surgeon, Mr. W. T. Rees, show the following percentages of cures:—

1886.	1887.	1888.	1889.	1890.
23·5	29·84	38·0	45·1	52·35

(3) Phthisis is stated (with one exception) to be infrequent among residents. A majority of the reporters regard cases associated with hæmoptysis as unsuitable. Visitors and residents in the early



stages of the disease (before the formation of cavities) do well "in the spring, summer and autumn," "in the south-west aspects of the town."

(4) Bronchitis and catarrh would seem to be of average frequency among residents; the desirability of sending sufferers from these ailments to Margate is not strongly emphasised, although one statement is to the effect that "chronic bronchitics pick up well here, and not a few have told me that they are better here than at warmer places on the coast. My experience does not go so far as to recommend it strongly for chronic bronchitis." Another report states that "Sufferers from chronic catarrh, especially of the post-nasal variety and with tendency to adenoid vegetations, appear to derive benefit."

(5) Pneumonia is stated by a majority of the reporters to be rare. (Among 3,000 inmates of the Royal Sea Bathing Infirmary only one case occurred.)

(6) The same remark applies to pleurisy. "For old empyema, with difficulty in healing the sinus, Margate air appears to have an almost specific effect."

(7) Acute renal dropsy is rare; one reporter had not seen a case among residents for five years, and only one (post-scarlatinal) among visitors. Another reporter had not seen a case of post-scarlatinal dropsy.

(8) Chronic albuminuria is regarded as uncommon among residents or of average frequency only. The climate is not specially recommended for patients of this kind.

(9) Calculus and gravel<sup>1</sup> are stated to be "uncommon," "very rare" or "unknown." Only one observer remarks, "I should consider lithiasis in all its forms rather prevalent; not other forms of calculus disease."

(10) Acute rheumatism appears to be infrequent. Sub-acute rheumatism occurs rather commonly among the aged poor, and others when living under unfavourable circumstances.

(11) Muscular rheumatism is common. Neuralgia is of average frequency. "Sciatica is not uncommon, but is not of acute type."

(12) Rheumatoid arthritis is not rare amongst the aged. "Visitors do not appear to seek Margate when suffering from this disease."

<sup>1</sup> On this subject consult the *Statistical Data*, p. 271, and pp. 442, 443.

(13) Eczema would seem to be of average frequency. One reporter finds no beneficial results in visitors except in lupus vulgaris, under treatment (by scraping). Others record their opinion that "skin diseases do well." Eczema generally improves. "Apart from treatment such cases improve."

(14) Diarrhœa is not common among residents, even in summer; but very common among the multitudes of children brought to Margate in summer, and in them easily explained in connection with errors in diet, &c.

(15) Scarlet fever is rather common, owing to the number of schools (2,000 children), and of the frequent importation of the affection from London. It is "singularly mild in type." In the Royal Sea Bathing Infirmary about three cases occur annually.

(16) Tonsillitis is not uncommon among summer visitors; not frequent among residents.

*Longevity* is stated to be of frequent occurrence, and the diseases of old age, or senile decay to be among the more common causes of death.

*The Drainage.*—About  $\frac{5}{8}$ ths of the surface can be drained naturally, about  $\frac{1}{8}$ th being below high-water mark, and here surface water is carried by the sewers.

Margate has lately been drained by the hydraulic tubular system. The drainage is lifted in sections from the low level by self-acting engines worked by hydraulic power, afterwards finding its way by gravitation to the sea. (New scheme by Baldwin Latham.) The sewer is discharged into the sea, at the outer extremity of the Longnose Spit Rock, at a spot distant about two miles east of the Margate jetty. In the neighbourhood of the Foreness Point the sewer is so constructed as to afford intermittent storage during the period of inflowing tide. By this means the sewage can be discharged only when the tide is running directly away from Margate, and a serious evil is henceforth remedied.

At present only part of the town (here and there) is connected, the bulk of the town still using cesspools. "The Westbrook and King Street districts have been drained by the tubular system for some years, but the latter part (King Street) not very effectually." "All privies and cesspools are being abolished as rapidly as possible. House to house collection of refuse has been some time in operation."



*The Water Supply.*—"Unexceptionally good, from chalk strata at some distance from the town." "Good." "Until the last two years the water supply was insufficient. Now new works (the Dane works) have been erected, and I have heard no complaints as regards quantity. The water is not always absolutely clear and sparkling, but I consider it sufficiently pure to drink it myself, and allow my household to do the same, without boiling or filtering."

*Public Health of Margate.*—The reports of the Medical Officer of Health for Margate, Mr. A. W. Scatliff, D.P.H., show a low and decreasing death-rate (14·53 for 1889; 12·8 for 1890; 11·4 for 1891 per thousand), and a birth-rate of about 21·5 per thousand. The census of 1891 gave a population of 18,478 (exclusive of visitors). The statements contained in the special reports from individual practitioners as to the rarity of infectious and endemic diseases are fully borne out by the report. The zymotic death-rate for 1891 was only 0·5. The infantile deaths (under one year of age) were at the rate of 116 per thousand births.

**The Margate Hospitals.**—The following are some of the more important hospitals and the convalescent homes in Margate: The Royal Sea Bathing Infirmary. There are 220 beds, but 140 are closed at present. The Deaf and Dumb Asylum accommodates 320 children. The Orphan Asylum (Wanstead) Convalescent Home receives children from the asylum needing change. The Orphan Working School Convalescent Home. The Cripples' Nursery (seaside branch). The Margate Cottage Hospital (for accidents). The Seaside Home of Young Men's Christian Association. Convalescent Home for patients from Pauper Unions, adults and children (two establishments). There is a Fever Hospital accommodating between thirty and forty patients at a place called Northwood, between Margate and Ramsgate, to which all infectious cases requiring isolation can be removed.

#### BROADSTAIRS AND ST. PETER'S.

The small town of Broadstairs, numbering about 5,000 permanent inhabitants, is built on the cliffs, half way between Ramsgate and Margate, and faces almost due east. A slight projection, which is continued into the old-fashioned pier, marks

## MARGATE.

*Table specially prepared for the Report to the Royal Medical and Chirurgical Society.*

## I.

## MONTHLY MEANS FOR THE PERIOD 1882-1889.

MONTH.	Mean Pressure of Atmosphere in Month. (9 A.M. & 9 P.M.)	TEMPERATURE OF AIR IN MONTH.						Mean Temperature of Air in Month.	Mean Relative Humidity (9 A.M.)	Mean Maxima in Sun.	Amount of Sunshine.	WIND (9 A.M. & 9 P.M.).					Mean Ozone.	Mean Cloud (9 A.M.)	RAIN.	
		* Highest.	* Lowest.	Range.	Mean of Highest.	Mean of Lowest.	Mean Daily Range.					Calm.	N.	E.	S.	W.			Days it fell.	Inches
January ...	30.013	55.6	18.2	37.4	43.2	35.0	8.2	39.1	90	...	...	*	9	5	12	17	...	7.6	16	1.78
February ..	30.019	55.8	16.4	39.4	44.1	35.6	8.5	39.8	88	...	...	2	8	14	18	14	...	7.4	14	1.51
March ...	29.949	65.6	23.6	42.0	46.1	35.6	10.5	40.8	83	...	...	5	12	17	14	14	...	6.7	14	1.32
April .....	29.893	70.3	30.0	40.3	51.5	40.1	11.4	45.8	78	...	...	5	13	18	13	11	...	6.5	15	1.55
May .....	29.959	74.8	34.0	40.8	58.4	45.5	12.9	51.9	76	...	...	6	13	13	16	14	...	6.7	12	1.66
June .....	30.036	82.8	41.1	41.7	63.8	51.2	12.6	57.5	77	...	...	6	17	14	12	11	...	6.7	9	1.16
July .....	29.970	82.1	43.3	38.8	68.1	53.9	14.2	61.0	73	...	...	6	5	11	19	21	...	6.8	14	1.97
August ...	29.998	85.1	45.0	40.1	68.1	54.5	13.6	61.3	75	...	...	10	7	10	14	21	...	6.3	12	1.32
September	30.000	85.7	38.5	47.2	63.4	52.2	11.2	57.8	80	...	...	6	9	12	15	18	...	6.4	13	2.63
October ..	29.926	75.0	30.5	44.5	55.5	44.9	10.6	50.2	84	...	...	8	9	8	18	19	...	7.0	17	3.01
November	29.956	64.1	22.0	42.1	49.3	40.3	9.0	44.8	87	...	...	7	6	12	18	17	...	7.4	17	2.74
December	30.007	56.0	23.0	33.0	44.4	35.8	8.6	40.1	89	...	...	7	9	9	18	19	...	7.7	18	2.30

\* Barometer and Wind are for the years 1883-89.



## MARGATE.

*Table specially prepared for the Report to the Royal Medical and Chirurgical Society.*

II  
QUARTERLY AND YEARLY MEANS FOR THE PERIOD 1882—1889.

QUARTERS AND YEAR.	Mean Pressure of Atmosphere (9 a.m. & 9 p.m.).	TEMPERATURE OF AIR.						Mean Tem- perature of Air.	Mean Relative Humidity (9 a.m.).	Mean Maxima in Sun.	Amount of Sunshine.	WIND (9 a.m. & 9 p.m.).					Mean Ozone.	Mean Cloud (9 a.m.).	RAIN.	
		* Highest.	Lowest.	Range.	Mean of Highest.	Mean of Lowest.	Mean Daily Range.					Calm.	N.	E.	S.	W.			Days it fell.	Inches.
Jan.—Mar.	29.994	65.6	16.4	49.2	44.5	35.4	9.1	39.9	87	...	...	*	16	25	43	49	..	7.2	44	4.61
Apr.—June	29.963	82.8	30.0	52.8	57.9	45.6	12.3	51.7	77	...	...	*	17	43	45	41	.	6.5	36	4.37
July—Sept.	29.989	85.7	38.5	47.2	66.5	53.5	13.0	60.0	76	...	...	22	21	33	48	60	...	6.5	39	5.92
Oct.—Dec.	29.963	75.0	22.0	53.0	49.7	40.3	9.4	45.0	87	...	...	22	24	29	54	55		7.4	52	8.05
Whole Year	29.977	85.7	16.4	69.3	54.7	43.7	11.0	49.2	82	...	...	77	113	150	192	198	..	6.9	171	22.95

\* The Barometer and Wind Observations are for the years 1883—89.

the northern extremity of the town; and Bleak House, which occupies the highest spot on this promontory, commands a view both south into the harbour and towards Ramsgate, and north towards the North Foreland and the German Ocean.

From the pier, near which the old houses occupy the level of the beach, the town gradually rises to the cliffs about 100 feet high; and, behind the sea front, the ground continues to rise towards St. Peter's.

The promenade on the almost perpendicular cliff commands a good view of the beach; and the terrace of houses which follow the same semicircular outline stand back some distance from its edge.

At the foot of the cliffs, between them and the sea, is a fairly broad belt of fine sandy beach,<sup>1</sup> which is protected from all winds except the south-east.

*Aspect and General Climatology.*—The town, with the exception of the pier and of the promontory from which it projects, has no northerly aspect, the cliffs rising higher towards the North Foreland. From the westerly winds Broadstairs is partly sheltered by the gentle slope to the plateau of Thanet. This protection, in addition to that afforded by the front terrace of houses, allows some of the gardens at the back considerable luxuriance of vegetation. Towards Ramsgate also the cliffs rise in altitude.

Owing to these peculiarities Broadstairs is more protected than Margate, and somewhat more protected than some parts of Ramsgate. The houses on the front terrace face, according to their individual sites, south, south-east and east.

*Special Climatology.*—In the absence of direct meteorological records we may assume that the meteorological values would be not far removed from those of Ramsgate, with the climate of which that of Broadstairs presents most affinity. The geological conditions are, practically speaking, identical.

In respect of relative quiet, residents at Broadstairs have hitherto enjoyed advantages which are likely to diminish with the

<sup>1</sup> The beach at Broadstairs is more protected than might be expected from its eastern aspect. The abrupt wall of crescentic cliff seems to have the effect of arresting currents of air, so that when a strong east wind blows straight into Broadstairs, and makes itself bitterly felt on the cliffs and inland, there is relative warmth and shelter on the beach. Perhaps the upper current of air rebounds from the cliff and produces comparative calm immediately below it.



already rapid growth of the town. It was, and comparatively still is, a peaceful resort, soothing by its noiseless and uneventful ways, and self-contained in spite of the vicinity of its bustling neighbours, Ramsgate and Margate.

*The Prevalence of Diseases; and the Climate as affecting the Patients.*—In Mr. Raven's Report the special points which call for notice are :

(1) The occasional prevalence of pneumonia—which has been known to be "epidemic." (2) The infrequency of pleurisy. (3) The infrequency and successful treatment of hay-asthma. (4) The rarity of acute renal dropsy, and of calculus and gravel, chronic albuminuria being rather common. (5) The common occurrence of rheumatism, rheumatoid arthritis and neuralgia. Asthenic cases are benefited. (6) The frequency of eczema. (7) The extraordinary rarity of scarlet fever (until lately); the frequency of follicular tonsillitis, and in August and September, of diarrhœa. (8) The frequency of old age on the whole.

*Medical Officer of Health's Report on Broadstairs Urban Sanitary District.*<sup>1</sup>—In the Broadstairs and St. Peter's Local Board District (area 1,453 acres), during the year ending December 31, 1891, on the preliminary census of 5,266, the birth-rate was 15·7, and the death-rate, 13·6 per 1,000, 20 deaths (including 9 from consumption) were referred to diseases of the lungs, 10 to heart disease, 2 to injuries, 1 to diphtheria, and the remaining 39 to old age and various other causes.

Only one death was referred to zymotic disease.

The extension of the drainage system to Broadstairs has been the subject of a report.

#### ST. PETER'S.

The rapid extension of Broadstairs towards St. Peter's fore-shadows their eventual junction. For a time however St. Peter's retains its rural charm.

Climatically it enjoys the advantage of the neighbourhood of the sea without direct exposure, and is partly protected from the winds which visit the summit of the plateau of Thanet, the village being situated on its eastern slope. This protection is strikingly

<sup>1</sup> From Dr. M. K. Robinson's Report for 1891, to the Sanitary Authorities of the East Kent Joint Committee.

shown by the abundant growth of trees and hedges; some of the trees are remarkable in age and in size.

St. Peter's and the residences scattered in the same district of the island, and mostly surrounded by plantations, represent a lower degree in the list of tonic resorts in Thanet, of which Margate occupies the top. In the future it might be used as a place of acclimatisation for those eventually seeking stronger influences.

#### RAMSGATE.

*General Configuration.*—The town, distant from London seventy-five miles, is built at the south-eastern corner of the Isle of Thanet. One portion of the sea-front, the smaller one, faces south, the remainder being exposed to the south-east.

Cliffs, known as the East and West Cliffs, extend nearly the whole way, and beyond the town on either side, and are interrupted by a fairly extensive cutting, gap, gate, or coomb, which may be traced inland as far as Northwood, separating that hamlet from St. Lawrence. The market-place and the principal streets occupy the gap, and the town spreads in terraces, squares, and residences over adjacent hills continuous with the East and the West Cliffs and over the area behind them. A road is being constructed to join the two cliffs by the harbour along the sea-front.

The West Cliff is rather more sheltered, and is generally considered the warmer of the two. The slight difference in the aspect of the terraces on the two cliffs is in favour of the West Cliff as a winter resort. Moderately steep ascents lead up to the cliffs and away from the sea, the rise continuing through the town to its extreme limits, and beyond them towards St. Lawrence and St. Peter's and towards Broadstairs. Thus Ramsgate possesses considerable natural shelter from the winds blowing across Thanet from the north and from the west; whilst at the foot of the cliffs this shelter becomes absolute.

As elsewhere in Thanet, the sea rises close up to the cliffs. The "Ramsgate sands" are much contracted at each rising tide, and easily overcrowded, their sheltered position being an attraction which appeals to all. The harbour, visited almost daily by foreign fishing smacks, and the two piers are also favourite walks.

*Aspect and Shelter.*—It is seen from what precedes that the winds reaching Ramsgate would range mainly from east-north-east



to south-west-south. This of course does not apply to the outlying parts, extending to the brow of the Thanet plateau. In most of the situations facing the sea a yet more limited range of winds would be found to prevail. The eastern extremity of the cliff would receive the sea-breeze from the east and north-east; and the western extremity, that from the south and south-west, at least in part.

Without venturing into the detail of street climatology, it will suffice to say that terraces and crescents have been so arranged as to secure a maximum of shelter from trying winds, and of exposure to the sun.

*General Climatology.*—The general climatology of Ramsgate is that of Thanet modified by its situation on the south-eastern slope of the plateau, and by its aspect towards two seas. Of the large towns of Thanet it is climatically the most protected. In some parts it is highly protected from the colder winds, and its climate approaches that of the South Coast. With this, however, it is nowhere identical. Even in its stillest corners the keen Thanet air is constantly moving. In very general terms the climate may be described as "easterly, marine, bracing, with partial southern exposure."

*Subsoil.*—The town is entirely built on a subsoil of chalk, and enjoys the advantages special to this geological formation, which have been described under the climatology of Thanet.

*Special Climatology.*—As regards temperature, cloudiness, and humidity, the following returns apply strictly to the Meteorological Station only, but they probably convey a correct idea of the conditions prevailing in Ramsgate generally. For the sake of facilitating comparison, the figures for Margate are included in the tables (see opposite page).

If we compare the values special to Ramsgate with those occurring in the long list of localities considered in Mr. Bayard's paper,<sup>1</sup> we find that, as regards the paucity of rainy days, Ramsgate is exceeded only by six of the stations of the Royal Meteorological Society, and, as regards smallness of the rainfall, by four only. Margate, with an excess of six rainy days, had nearly an inch less rain than Ramsgate.

<sup>1</sup> "English Climatology during the period 1881-1890," read before the Royal Meteorological Society on June 15, 1892, by Francis Campbell Bayard, Esq. F.R.Met.Soc.

METEOROLOGICAL OBSERVATIONS TAKEN AT RAMSGATE AND AT MARGATE.\*

	STATION.	YEAR.											
		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
ix.	No. of Rainy Days (0.01 in. and upwards) 1881-90 {	16	14	13	14	12	9	14	14	14	16	17	16
	Ramsgate . . . . .	15	13	13	14	11	9	13	12	14	16	17	16
	Margate . . . . .	17	14	14	14	11	9	13	12	14	16	17	16
viii.	Mean Rainfall, 1881-90 . . . . .	1.72	1.41	1.44	1.51	1.56	1.38	2.12	1.76	2.48	3.11	2.65	2.17
	Ramsgate . . . . .	1.62	1.43	1.66	1.52	1.60	1.44	2.49	1.87	2.58	3.11	2.71	2.20
	Margate . . . . .	1.82	1.43	1.66	1.52	1.60	1.44	2.49	1.87	2.58	3.11	2.71	2.20
vii.	Mean Amount of Cloud at 9 A.M., 1881-90 . . . . .	7.6	7.5	6.7	6.5	6.2	6.7	6.8	6.3	6.4	6.9	7.5	7.6
	Ramsgate . . . . .	7.5	7.4	6.7	6.3	6.0	6.4	6.4	6.0	6.4	6.6	7.3	7.6
	Margate . . . . .	9.0	8.7	8.4	7.9	7.7	7.7	7.4	7.7	8.0	8.4	8.8	8.2
vi.	Mean Relative Humidity at 9 A.M., 1881-90 . . . . .	90	87	84	79	76	75	74	77	80	86	88	90
	Ramsgate . . . . .	90	87	84	79	76	75	74	77	80	86	88	90
	Margate . . . . .	90	87	84	79	76	75	74	77	80	86	88	90
v.	Mean Temperature, 1881-90 . . . . .	38.9	39.6	41.2	45.7	52.1	57.5	61.3	61.0	58.0	50.1	45.1	39.4
	Ramsgate . . . . .	39.0	39.5	41.5	46.3	52.6	57.9	61.3	61.0	58.2	50.0	45.2	39.1
	Margate . . . . .	43.1	43.6	46.7	51.2	58.6	64.0	68.5	67.8	63.6	55.2	49.7	43.5
iv.	Mean Maximum Temperature, 1881-90 . . . . .	43.5	44.0	47.2	52.6	59.7	65.1	69.0	68.4	64.4	55.6	50.1	43.5
	Ramsgate . . . . .	43.5	44.0	47.2	52.6	59.7	65.1	69.0	68.4	64.4	55.6	50.1	43.5
	Margate . . . . .	34.8	35.4	35.9	40.1	45.6	51.1	54.0	54.4	52.4	44.4	34.0	34.7
iii.	Mean Minimum Temperature, 1881-90 . . . . .	34.8	35.4	35.9	40.1	45.6	51.1	54.0	54.4	52.4	44.4	34.0	34.7
	Ramsgate . . . . .	34.8	35.4	35.9	40.1	45.6	51.1	54.0	54.4	52.4	44.4	34.0	34.7
	Margate . . . . .	38.3	39.1	41.2	46.5	53.4	58.6	62.0	62.0	58.6	50.2	45.1	39.2
ii.	Mean Temperature at 9 A.M., 1881-90 . . . . .	38.2	39.2	41.2	46.7	53.7	59.0	62.6	62.4	58.9	50.3	44.9	39.0
	Ramsgate . . . . .	38.2	39.2	41.2	46.7	53.7	59.0	62.6	62.4	58.9	50.3	44.9	39.0
	Margate . . . . .	38.2	39.2	41.2	46.7	53.7	59.0	62.6	62.4	58.9	50.3	44.9	39.0

\* Meteorological Observations, tabulated by Francis Campbell Bayard, F.R. Met. Soc., in a paper on English Climatology, 1881-1890.—Read June 15, 1892.



In percentage of cloudiness 6·7, which is less than at Margate (6·9), it is nearly equally distant from the extreme figures, 7·7 and 5·4, and the same remark applies to the percentage of humidity, which is 82 against 79 and 86; the monthly average being nearly identical for the two stations.

The mean yearly temperature, 49°·3, approaches the highest figure, 51°·5, more closely than the lowest, 46°·2.

The mean maximum temperature, 55°·3, compares favourably with the highest, 57°·0, and with the lowest, 51°·6.

The mean minimum temperature, 43°·3, is above the English average, although not approaching the unusual record of Ilfracombe, 46°·9, and of Guernsey, 49°·9.

The mean temperature at 9 A.M., 49°·7, shows a favourable contrast with the lowest record, 45°·4, and is not very distant from 51°·2, the highest record obtained elsewhere. Under all these headings the temperature of Ramsgate shows a slightly higher level than that of Margate.<sup>1</sup>

These facts may be summed up in a few words: Ramsgate is favoured with a relatively warm, relatively equable, and moderately dry climate. Its sky is moderately free from cloud. Its rainfall and the number of its rainy days are smaller than those of the great majority of stations in England.

**Public Health of Ramsgate.**—The following facts are reported by Dr. T. G. Styan,<sup>2</sup> Medical Officer of Public Health:—

The resident population having increased in ten years from 22,683 to 24,676, and the birth-rate per 1,000 decreased from 31·6 in 1880 to 26·9 in 1891, the death-rate has fallen from 19·1 to 14·6, and the zymotic death-rate from 2·9 to 1·2. In 1891 more than one-third of the deaths occurred at over 60 years of age, and the infantile mortality (under one year of age) was low (118 per 1,000 births).

In 1889 the number of deaths at or upwards of 80 years of age was about one-eleventh of the total number, and in 1890 one-twelfth of the total (see Annual Reports for 1889 and for 1890).

<sup>1</sup> The figures upon which these remarks are based were extracted from the paper on "English Climatology during the period 1880-1890," read before the Royal Meteorological Society on June 15, 1892, by Francis Campbell Bayard, Esq., F.R.Met.Soc.

<sup>2</sup> *Annual Report of the Health, Sanitary Condition, &c., of the Borough of Ramsgate for the year 1891.*

**Report from the Medical Society of Ramsgate on the Prevalence of, or Immunity from, Diseases, and on the Effects of the Climate on Patients.**

In the Special Report of the Medical Society of Ramsgate,<sup>1</sup> received in December, 1891, there is a general agreement with the summarised report relating to Thanet, few points only requiring to be emphasised:—

(1) Phthisis (which is not common among residents)—the death-rate during the year 1888–1889 having been only 1·1 and 1·3 per 1,000<sup>2</sup>—is benefited in visitors, especially in the winter months.

(2) The death-rate from all diseases of the respiratory organs was, during 1888, 2·0; 1889, 2·1; and 1890 (the first year of the influenza epidemic), 2·5 per 1,000. (3) Ordinary catarrh is sometimes prevalent, but seldom followed by bronchitis, pneumonia, or pleurisy.

(4) Acute renal dropsy is very rarely seen by medical practitioners. Chronic albuminuria is more frequent. Calculus and gravel<sup>3</sup> are exceedingly rare.

(5) Acute rheumatism is rare, and chiefly seen among fishermen and sailors. Neuralgia is common, even in those who appear to be in good health otherwise. (6) Rheumatoid arthritis is not severe, and markedly less frequent than in inland localities. A considerable number of patients from elsewhere come to the town and derive benefit from the salt water and ozone baths.

(7) Eczema is fairly common; other skin diseases infrequent.

(8) Diarrhœa is on the decrease. In 1890 only seven children died from this cause, although nearly 100,000 persons visited the town in the course of the summer, in addition to the ordinary residents. (9) Sore throat, when prevalent, generally coincides with east winds accompanied by damp and cold weather.

(10) Longevity is a noticeable feature; some remarkable instances may be adduced.

<sup>1</sup> The opinions stated are extracted from a report drawn up, in reply to the circular letter, by the Ramsgate Medical Society, through the instrumentality of the Hon. Sec., Dr. Charles Cotton, and forwarded to the Reporter by Dr. T. G. Styant. The report "was approved by a full meeting of the Society, and expresses in general terms the unanimous opinions of its members." It refers only to residents.

<sup>2</sup> The death-rate from phthisis in England and Wales in 1891 was 1·599 per 1000.

<sup>3</sup> On this subject compare the *Statistical Data*, p. 271, and pp. 442, 443.



*The Common Causes of Death* are chiefly those incidental to the two extremes of age. Thus, during the last three years (1888-89-90) 1,113 deaths have taken place among the permanent residents, of which only 378 have occurred between the ages of five and sixty, whilst no fewer than 104 have occurred at eighty years and upwards. Three centenarians have died in the course of the last seven years, viz. :—Miss C., in 1884, aged 100 all but a few days; Sir M. M., 1885, aged 100 and five months; Miss W., in 1889, aged 103 and eight months. And there is one resident, Miss F., now living, aged 103 and a few weeks.

One medical practitioner, who is also the Poor Law Medical Officer, reports as follows:—"During the ten years 1879 to 1889 there were 177 deaths amongst the patients in my practice (not including infants under one year of age). Their aggregate ages at death amounted to 10,253 years, giving an average of 57 years and 7 months. Of the total number 42 died between the ages of 70 and 80, 27 between 80 and 90, and 7 between 90 and 100—namely, two at 91, one at 93, two at 95, one at 96, and one at 99. It will thus be seen that *nearly one half* of the whole number lived to be over 70 years of age."

*Drainage.*—The town is thoroughly drained by the tubular system. The natural fall is good, and requires no mechanical assistance. The outfall is into the sea, a third of a mile from low-water mark.

The Water is obtained from two deep adits, tunnelled through the chalk to the north of the town. The supply is constant. The following is the last official analysis by Mr. Sidney Harvey, F.I.C., F.C.S., Public Analyst, Borough of Ramsgate:—

Appearance . . . . .	Clear
Smell . . . . .	None
Chlorine in Chlorides . . . . .	5'60
Phosphoric Acid in Phosphates . . . . .	Traces
Nitrogen in Nitrates . . . . .	0'72
* Ammonia . . . . .	None
Albuminoid Ammonia . . . . .	'0017
Oxygen absorbed in fifteen minutes . . . . .	None
" " four hours . . . . .	'024
Hardness before boiling (Total) . . . . .	23'90
Hardness after boiling (Permanent) . . . . .	6'28
Total Solid Matter . . . . .	35'70

All numerical results expressed in grains per gallon.

"The samples indicate a supply of great organic purity, and free from all noxious matter."

RAMSGATE.  
*Table specially prepared for the Report to the Royal Medical and Chirurgical Society.*

## I.

## MONTHLY MEANS FOR TEN YEARS (1880 to 1889).

Month.	Mean Pressure of Atmosphere in Month (9 A.M. & 9 P.M.).	TEMPERATURE OF AIR IN MONTH.						Mean Temperature of Air in Month.	Mean Relative Humidity (9 A.M.).	Mean Maxima in Sun.	Amount of Sunshine.	WIND (9 A.M. & 9 P.M.).					Mean Ozone.	Mean Cloud (9 A.M.).	RAINS.	
		Highest.	Lowest.	Range.	Mean of Highest.	Mean of Lowest.	Mean Daily Range.					Calm.	N.	E.	S.	W.			Days it fell.	Inches.
January ...	...	55.2	20.3	34.9	43.3	34.4	8.9	38.8	89	...	...	...	...	...	...	...	...	7.3	15	1.76
February...	...	58.4	19.0	39.4	43.9	34.9	9.0	39.4	87	...	...	...	...	...	...	...	...	7.4	14	1.54
March ...	...	63.6	20.1	43.5	45.8	34.7	11.1	40.3	83	...	...	...	...	...	...	...	...	6.9	14	1.44
April ...	...	66.2	28.1	38.1	52.6	39.6	13.0	46.1	78	...	...	...	...	...	...	...	...	6.4	13	1.40
May ...	...	77.3	32.9	44.4	59.3	45.1	14.2	52.2	76	...	...	...	...	...	...	...	...	6.1	12	1.73
June ...	...	81.2	41.2	40.0	65.2	50.9	14.3	58.0	75	...	...	...	...	...	...	...	...	6.3	7	1.08
July ...	...	83.6	42.3	41.3	68.8	53.6	15.2	61.2	74	...	...	...	...	...	...	...	...	6.3	13	2.32
August ...	...	83.2	44.2	39.0	69.1	53.7	15.4	61.4	74	...	...	...	...	...	...	...	...	6.0	9	1.35
September	...	80.8	35.0	45.8	64.6	51.9	12.7	53.2	79	...	...	...	...	...	...	...	...	6.2	15	2.98
October ...	...	72.9	27.8	45.1	55.7	43.9	11.8	49.8	86	...	...	...	...	...	...	...	...	6.6	15	2.86
November.	...	61.3	22.2	39.1	49.8	40.1	9.7	45.0	88	...	...	...	...	...	...	...	...	7.5	16	2.84
December.	...	55.3	21.8	33.5	44.2	35.3	8.9	39.8	90	...	...	...	...	...	...	...	...	7.5	17	2.25

H H



RAMSGATE.  
*Table specially prepared for the Report to the Royal Medical and Chirurgical Society.*

## II.

## QUARTERLY AND YEARLY MEANS FOR THE PERIOD 1883 to 1889.

QUARTERS AND YEAR.	Mean Pressure of Atmosphere (9 A.M. & 9 P.M.).	TEMPERATURE OF AIR.							Mean Tem- perature of Air.	Mean Relative Humidity (9 A.M.).	Mean Maxima in Sun.	Amount of Sunshine.	WIND (9 A.M. & 9 P.M.).					Mean Ozone.	Mean Cloud (9 A.M.).	RAIS.	
		Highest.	Lowest.	Range.	Mean of Highest.	Mean of Lowest.	Mean Daily Range.	Calm.					N.	E.	S.	W.	Days it fell.			Inches.	
Jan.—Mar.	...	63·6	19·0	44·6	44·3	34·7	9·6	39·5	86	...	...	...	...	...	...	...	7·2	43	4·74		
Apr.—June.	...	81·2	28·1	53·1	59·0	45·2	13·8	52·1	76	...	...	...	...	...	...	...	6·3	32	4·21		
July—Sept.	...	83·6	35·0	48·6	67·5	53·1	14·4	60·3	76	...	...	...	...	...	...	...	6·2	37	6·35		
Oct.—Dec.	...	72·9	21·8	51·1	49·9	39·8	10·1	44·9	88	...	...	...	...	...	...	...	7·2	48	7·95		
Whole Year.	...	83·6	19·0	64·6	55·2	43·2	12·0	49·2	82	...	...	...	...	...	...	...	6·7	160	23·25		

## ST. LAWRENCE.

Although St. Lawrence has of late acquired some climatic celebrity, it is difficult to describe it otherwise than as an extensive and scattered suburb of Ramsgate. It lies mainly north-west of the town, chiefly on high ground, but it includes a variety of aspects. As a parish it is unusually straggling, constituting part of the western suburb, but forming also the extreme east of Ramsgate and including the site of the Granville Hotel. Its central position enjoys some protection from the north and east, although, within half a mile's walk, a further rise in the ground brings one to the culminant point in the island.

It has many favourably situated residences, high and bracing, and quieter than more central portions of Ramsgate. Although some parts of St. Lawrence are rather exposed for the winter, whilst excellent in summer, it may be recommended for all the year round as a bracing resort.

## THE EAST KENTISH COAST.

**General Physical Features of the East Coast opposite the Downs.**—Between the rapid fall of the Thanet cliffs from Pegwell to Cliff's End, and the rise of the Dover and Folkestone cliffs at Kingsdown and Old Stairs Bay, the coast is absolutely flat, and runs almost due south, in a smooth and, but for Pegwell Bay, unbroken line, facing the sand banks known as the Downs.

Although the narrow loop of the Stour, which includes Ebbsfleet and Great Stonar, brings the most southern boundary of Thanet within a short distance of Sandwich, and although Pegwell Bay also belongs to the isle, yet climatically and geologically the low-lying district south of Ramsgate may be considered distinct from the rest of Thanet, and may be most conveniently described together with the lowland of Sandwich.

The geological map shows that the belt of London clay and Woolwich beds which is continued almost uninterruptedly along the south bank of the Thames, acquires greater thickness in East Kent, of which it occupies the northern third, isolating the chalk territory of Thanet from the chalk range south of Canterbury and Deal.



The alluvial deposit on either side of the Stour, and of its tributaries including the Channel, breaks up the clay deposit into separate patches, one of which, including Minster, famous for its old church, forms part of Thanet and of the coast of Pegwell Bay. The belt of alluvium lies south of Minster, surrounding the Isle of Thanet on its southern as well as on its western side, and occupying the sea-front between Reculver and the neighbourhood of Birchington in the north, as well as along the whole distance between Pegwell Bay and Deal towards the east. The latter interval makes up the middle third of the distance between the North Foreland and the South Foreland; and we may, therefore, regard the East Kent coast as composed of three sections: (1) the Thanet cliffs (with a short line of clay at Pegwell Bay); (2) the alluvial lowland of Sandwich and Deal; and (3) the chalk cliffs between Deal and Dover, at the foot of which lies the health resort of St. Margaret's Bay.

(1) Of the first section the greater part has already been considered in connection with the Isle of Thanet. Pegwell Bay is a broad, open bay, the northern shore of which runs east and west, and is therefore more protected. The rest faces east, as does also the Sandwich and Deal coast.

**(2) The Climate of the Districts of Sandwich and Deal.**—The Sandwich coast begins at Shellness Point. It is covered by a belt of blown sand, which broadens out opposite the town and again becomes narrower as it approaches Deal, bearing here the name of the "Deal sand hills." The sandy soil of the dunes is steadied by a scanty growth of tough grass. Both at Sandwich and also at Deal—near the ruins of Sandown Castle—this circumstance has rendered possible the establishment of excellent golf links, which are in active use. The beach itself is not sand, but heavy shingle throughout.

The whole of this shore, and the background as far as the Canterbury hills to the north and the Dover plateau to the south, are open to the east wind, blowing across the North Sea, and the climate is analogous to any other unprotected line of coast north of the Thames with the same exposure.

Two circumstances, however, materially modify the harshness of the climate. In the first place the more southern latitude; and, in the second place, of still greater importance, the neighbourhood

of a southern sea, distantly under the influence of the Gulf-stream, and a highway for the tempered Atlantic breezes. For these reasons the climate of the stretch of land facing the Downs is not strictly comparable to any other climate on the east coast. In fact, when in walking along the Thanet coast we have turned the angle occupied by the Ramsgate harbour, we enter into a region which is not bracing in the same sense as that of the region we have left, and, indeed, is not bracing in itself so much as under the influence of strong breezes off the sea, and especially of the easterly and north-easterly winds.

(3) A little way beyond Walmer, at Kingsdown, the chalky sub-soil rises again into cliffs, and the climate is once more modified in a manner to be presently described (see St. Margaret's Bay). The short interval between Walmer and the Cliff is not so sandy as that mentioned above.

#### SANDWICH.

This ancient town retains none of its former greatness and prestige. Both have deserted it with the retiring sea, although it is still reached by ships of moderate tonnage which sail up the Stour between verdant meadows. The distance from the sea, due east, is one and a half mile, and from Pegwell Bay, due north, two and a half miles. Sandy dunes extend to the west, and a heavy loam and peat plain to the south.

By one of the gentlemen who have furnished reports of Sandwich the prevailing winds are described as blowing from the east or south-east—very rarely from the west. "Much high east wind is experienced in March, April, and May. Storm clouds usually divide and follow sea or hills; if not, the storms are felt very severely. The rainfall is below the average."

We learn from another report that "the summer temperature during the last thirty years has become appreciably lower. The autumn, especially September, is always fine. March is the rainy month. The prevalent wind blows from the south-west and brings rain,—or from the south. The east wind is felt chiefly in spring and is not wet."

The climate, as a whole, is regarded by the inhabitants as bracing, it is very often cold. The vegetation is very rich and luxuriant, especially pasture.



The plain which is on a level with the sea is drained by many dykes and ditches running into the river Stour. There are no hills within two miles.

The Delf, a stream which runs through the town, exclusively supplies it with water for all purposes. A Bill has been passed to supply the town with water from the hills to the north, distant seven to ten miles.

*Soil.*—Over part of the town sand forms the surface; over the remainder, clay. Subsoil water exists at no great depth.

*The Prevalence of, or Immunity from, Diseases; and the Effects of the Climate on the Patients.*

Replies to the inquiries were received from Messrs. Scott, M.D., and Harrison, M.B., C.M.

Anæmia and scrofula are not prevalent among the residents. Rachitis is unknown; but there is some spinal curvature. Among residents there is little phthisis, but some chronic bronchitis and catarrh, especially in spring. Strangers with phthisis improve for about two years, and then relapse. Pleurisy is occasionally seen; pneumonia rarely. Asthma is not common, but when present is severe.

Acute renal dropsy is uncommon; chronic albuminuria is also uncommon. Vesical calculus is very rare.

Articular and muscular rheumatism are common in the chronic form. Neuralgia also rather frequent. Chronic rheumatoid arthritis is also common.

Diseases of the skin, particularly eczema, are of average frequency.

Malaria is scarcely known. Tonsillitis is prevalent, but not diphtheria or epidemic sore throat. Typhoid fever occurs now and then. Diarrhœa is of average frequency only. Scarlet fever is not met with.

Among the inhabitants longevity (up to the ages of 80-87-90-92) is a noticeable feature.

30	deaths	occurred	over	60,	out	of	total	64	in	1888.
25	"	"	"	"	"	"	"	50	in	1889.
12	"	"	"	"	"	"	"	43	in	1890.

Respiratory catarrhs are stated to be the most common cause of death among residents.

The system of drainage adopted is an imperfect one: subsoil

pipes at no depth, some flushed by tidal river water and others by surface water. The existing cesspools are constructed to last for many years.

In conclusion, Sandwich would be very healthy if "drained" and "watered."

#### DEAL.

This is an old-fashioned town occupying a relatively large extent of sea-front, from the ruins of Sandown Castle to Walmer Castle, but not of proportionate depth, although under the name of Upper Deal it runs back for some distance inland along the road to Sandwich.

The diminutive town of Walmer, separated from the sea by Walmer Castle, may be regarded as an extension of Deal along the road to Dover.

*Geology.*—The northern half of Deal lies on the same bed of drift as Sandwich and the valley of the Stour—that is, on sand with shingle. The southern half is on chalk. It is backed by a dead plain, green and fertile, for a distance of five or six miles.

*Prevalent Winds.*—The south-west is moist, and often accompanied with gales. This is the most prevalent wind. The east wind, often deserving the local name of "black wind" on account of the gray skies which accompany it, is more common in spring. It is not wet.

Rain is specially abundant in March and in autumn. October, November, and December are comparatively mild, and form a "late season." January and sometimes December are cold months.

The sea current is rapid "like that of a river," and moves along the shore from south to north.

The climate is locally described as bracing. Some sort of breeze always blows.

Early vegetables bear witness to the mildness of the temperature.

#### *The Prevalence of, or Immunity from Diseases; and the Effects of the Climate on Patients.*

Mr. Lovell reports that typhoid, diphtheria, and scarlet fever are very rare, but there is some tonsillitis. Acute rheumatism is of



occasional occurrence. Muscular rheumatism is not uncommon, owing to exposure and to east winds.

Anæmia occurs only in young girls of the poorer classes, and improves by treatment.

Phthisis is rarely seen, and among boatmen only, exposed to the elements. Strangers with phthisis and also with bronchitis are benefited.

Influenza was very prevalent during the late epidemic.

Longevity is undoubted (one instance of 95 years).

*Drainage.*—The old part and the side streets still have cess-pools, but the new houses and main streets are drained into the sea.

*Water Supply.*—Water is derived from the hill of Upper Deal, one mile distant, and is laid on in the houses. It is chalky.

*Annual Report for 1891 of the Medical Officer of Health on the Eastry Rural Sanitary District.*<sup>1</sup>

During the year ending December 31, 1891, the birth-rate reached to 25·3 and the death-rate, after correction for the workhouse, 14·6 per 1,000.

Twenty-one deaths occurred from phthisis, 34 were referred to diseases of the lungs, 32 to heart disease, 6 to injuries, 6 to whooping-cough, 2 each to scarlet fever, enteric fever, and diarrhœa, 1 to measles, and the remaining 103 to old age and various other causes.

The rate of infant mortality was equal to 11·2 per cent. of the births; deaths at upwards of 60 years of age, reached 48·8 per cent. of the total deaths registered.

The zymotic death-rate was 1·01 per 1,000 of the population, and, but for the deaths due to non-notifiable diseases, would have been down to 0·3.

The following values for the Eastry District appear in the supplement to the Forty-fifth Annual Report of the Registrar-General, and are based on the figures for the ten years 1871-1880.

The general death-rate for the district of Eastry is 17·34 per

<sup>1</sup> From Dr. M. K. Robinson's *Report to the Sanitary Authorities of the East Kent Joint Committee for 1891*.

1,000, against 17·81 per 1,000 for Kent and 21·27 per 1,000 for England and Wales.

The mortality from cancer is 0·49, against 0·48 for Kent and 0·47 for England and Wales. The mortality from scrofula is 0·08, against 0·13 for Kent and also for England and Wales.

The mortality from phthisis is 1·86, against 1·83 for Kent and 2·12 for England and Wales. The mortality from diseases of the respiratory system is 2·61, against 2·82 for Kent and 3·76 for England and Wales. The mortality from diseases of the urinary system is 0·39, against 0·41 for Kent and 0·39 for England and Wales.

It appears from these returns that cancer is less prevalent than in Thanet, and scrofula much less prevalent. Phthisis is rather more prevalent than in the rest of Kent, although nearly one third less frequent than in England and Wales; whilst diseases of the urinary system show the normal frequency observed in England and Wales, being slightly less than that belonging to Kent.

#### **Medical Climatology of the Sandwich and Deal District.**

—It is matter for regret that no meteorological returns from this district are available, its climatology presenting additional interest by contrast with those of Thanet and Dover. It is quite open to the east wind, and almost undefended from the north-west wind which blows into the valley of the Stour from Reculver. Winds blowing from due north and from the north-north-east are partly warded off by the tableland of Thanet, but some of the draught works round.

Its absolute flatness, its vicinity to the Stour, to the clay areas of Minster, and to the much larger tract of clay extending between Canterbury and Sandwich, although they favour the vegetation, are not climatic recommendations; but along the sea-front, and over the portion known as the Sandwich Sands and the Dunes of Deal, the close approach to the sea and the sandy surface are valuable correctives to some of these objections.

Nevertheless, the district must be regarded as a very exposed one, lacking the dry bracing quality to be found on the chalky uplands. As a winter resort for invalids it is hardly likely to receive much support; but the golf links at Sandwich and Deal are a powerful attraction to a limited class of visitors; and in summer Deal fulfils a useful purpose as a seaside resort for a large



number of families of small means and without social ambition, who are content with simple attractions, and flock to it from various parts of the county and from London.

Ague, which was formerly prevalent at Minster and in the Sandwich district, does not appear to be noted now, perhaps owing to the improved drainage of the soil; but rheumatism is still of rather common occurrence.

Before we take leave of the district of Sandwich and of Deal, it is but right to point out that whereas its least favourable features, including an agueish past, an imperfect drainage, even to the present day, and in some places a doubtful water supply—all of which are now undergoing amelioration—have been long before us, we have heard very little of those advantages which are special to its climate. At a time when the need for accessible health resorts, especially for the poorer invalids, and of seaside accommodation for all classes, is more and more felt, climatological as well as meteorological data concerning this very habitable region of the coast are urgently wanted.

We are furnished with some meteorological data in the *Meteorological Atlas*. The district is included between the same isothermes as Dover and Ramsgate, and the *rainfall* is the smallest in England; but more precise information is required.

Both as a summer resort and as a permanent residence the district is available for those in full enjoyment of health. But our knowledge of the therapeutic indications of its climate must expand considerably before it can be utilised in the treatment of invalids as freely as it probably deserves to be.

#### ST. MARGARET'S BAY.

(For the particulars contained under this heading the reporter is indebted to the kindness of Dr. J. G. Marshall).

St. Margaret's Bay, with the village of St. Margaret's at Cliffe, situated about four miles north-east from Dover, is completely sheltered by the promontory of the South Forelands, the highest point of which exceeds 400 feet. The district may be defined as a triangle, the base of which is formed by the line of the Dover and Deal Railway, with these two towns as the extreme points. The main road from Martin Mill, the nearest station, bisects the tri-

angle. The ascent from the station is gradual, the road passing through the village of St. Margaret's at Cliffe, with its fine old Roman church, one of the most perfect of its kind in England.

The village itself is about half a mile from the sea, the rise being gradual till the top of the Bay Hill is reached, the elevation of which corresponds to the level of the South Foreland. Here the watering-place itself may be said to begin. From the Bay Hill the road descends by successive curves to the Bay itself, which lies picturesquely embosomed by the break in the cliffs eastward and westward.

The land at the sea-level has been considerably encroached on by the action of the sea. Forty years ago a wide expanse of good firm ground, apart from the beach, extended from the extreme point of the Foreland round to Deal, so that it was possible to drive a coach round at the base of the cliffs to the latter town. More recently, however, the inset of the tide, increased by the throwing out of the Admiralty Pier, has washed away all but the land in St. Margaret's Bay itself. It is to be hoped that by the judicious employment of sea defences further encroachment will be prevented.<sup>1</sup>

Extending for about a mile east and west, and completely sheltered from every wind but the south-east, south, and south-west by the lofty cliffs of dazzling whiteness so familiar to all who have crossed the Channel, the Bay proper has all the protected character of the Undercliff of the Isle of Wight, whilst enjoying the bracing climate of Ramsgate. Frost and snow are almost unknown in the winter, and vegetation thrives surprisingly. Being completely on the level, the invalid can enjoy a good long promenade within a stone's throw of the sea, and without being annoyed by the cold northerly or other winds that sweep the cliffs above. Of recent years a number of pretty villas have been erected facing the sea. As the road ascends by a zigzag to a second level, a very pleasant portion of the place is reached, the break in the cliffs sloping upwards. More houses and a first-class hotel are built on the various terraces and points of vantage. Many prefer this situation as being cooler in summer; and,

<sup>1</sup> Since the Report was printed a serious landslip occurred on February 3rd, 1895, in the cliffs between Dover and St. Margaret's. (See Report on Dover, p. 486.)



though it is not quite as much sheltered as the sea-level, yet almost as much protection is afforded by the high ground at the back, and by the eastward and westward slopes. With another upward curve a still higher level is gained, where the coastguard station and several private residences are situated, and a final rise in the road leads up to the top of the Bay Hill. The descent to the village from this point has already been described.

*The Soil* in the neighbourhood of St. Margaret's Bay is principally chalk, and is noted for its exceptional dryness. After the heaviest rain the surface of the ground dries very soon, and mud, dirt, &c., is consequently unknown, even in winter.

*The Rainfall* is less than at the average of coast stations—indeed, less than that of Dover and the adjacent towns. It is a well-known circumstance to dwellers in the neighbourhood that drought is far more to be feared than excessive rainfall.

*The Temperature* varies a good deal with the locality. In the Bay itself it is very much warmer than on the top of the cliff, and indeed, according to the situation of the dwelling selected, two or three different ranges of temperature may be enjoyed. It is an established meteorological fact that the temperature of this part of the coast in the extreme heat of the summer averages  $7^{\circ}$  to  $9^{\circ}$  less than the corresponding temperature of London, Oxford, and the inland towns.

*Wind.*—There is almost always a breeze, and, owing to the peculiar situation of St. Margaret's Bay under the projecting arm of the Foreland, every wind, with the exception of direct north or north-west winds, that blows over the place is a direct sea-breeze. "There is no other watering-place on the mainland of the United Kingdom of which the same can be said."

*The most favourable months for residence* at St. Margaret's Bay are from June to January. The later summer months, and especially the autumn, are most enjoyable. The sea, having been heated up to the summer temperature, cools in this part of the Channel very gradually, and, as a result, a more pleasant and equable temperature may be enjoyed in October and November than in the spring and early summer. It is possible, nay, almost certain, that the visitor to St. Margaret's Bay, in the three months preceding Christmas, will be able to dispense with fires, and read at an open window, enjoying an amount of sunshine and a freedom

from damp and fog which he would not find at any other watering-place on the coast.

This neighbourhood, together with Dover, Deal, and the rest of the East Kent coast towns, suffers severely from sea-fogs in the spring and early summer. Although not detrimental to health, being composed of pure particles of sea vapour, these fogs coming up suddenly are to some people annoying and even depressing; but during the latter part of the summer and all through the autumn the fogs which visit many other seaside resorts are unknown here.

The climate, being dry and bracing, is particularly adapted for all kinds of pulmonary disease, and cases of nervous exhaustion. The effect of the air of St. Margaret's Bay in cases of phthisis attended by debility, suppuration from cavities, &c., is remarkable. The hilly conformation of the place renders it somewhat trying to persons suffering from cardiac disease, asthma, or those for whom the ascent of hills is undesirable. Patients convalescing after operations, and suffering from the debility consequent on fevers, do remarkably well at the Morley Convalescent Home.

The neighbourhood itself is remarkably free from diseases, especially of the zymotic type, and the district is noted for the longevity of its inhabitants, as a glance at the Parish Register will testify.

Being yet in the early stage of its development, St. Margaret's Bay has no regular drainage or water supply, but the earth-to-earth system is largely adopted in the lodging-houses and hotels, the proprietors of which are fully aware of the importance of these matters.

The water, derived from the deep wells, of which there are many, going down several hundred feet into the chalk, is remarkably pure. In the Bay itself there are several springs of pure water arising from the rocks, the water from which, though actually on the beach, is not the least brackish. Most of the houses are well provided with rain-water tanks, and by some this water is preferred, when boiled and filtered, to the harder water of the wells. The water from the chalk, however, is by no means so hard as its source might be supposed to indicate.

There is a good postal service, with two mails each way daily, and a telegraph office. A medical man resides in the village, and all the ordinary requirements of life can be obtained in the place.



## THE GENERAL CLIMATOLOGY OF THE SOUTH COAST OF KENT AND SUSSEX.

A comparative study of the climatology of the south coast of England at its different stations would be a great and difficult task, which can only be attempted here in very broad outline. The materials for more searching inquiry in special directions are provided for the reader in connection with each of the localities separately considered in the Report.

The south coast as a whole presents a general uniformity of climate derived from its nearly uniform latitude and exposure to atmospheric and oceanic currents. Its local varieties are determined in a general way by the varying longitudes, implying gradations in the operation of Atlantic influences, but in a much more decided degree by local configuration and aspect. This is easily understood when we bear in mind that its climate is as it were a borrowed climate, conveyed to it from a distant equatorial zone, and enjoyed by it so to say on sufferance, in spite of its northern latitude, and so long only as the influences special to the latter are in greater or less degree withheld. Local protection from the north wind possesses, for this reason, along the south coast of England, a climatic importance not equalled in many regions; and the climatic differences between its various sites cannot be expressed in any general formula. As we proceed to analyse very briefly the meteorological factors, the same reservation will be found to apply more or less prominently to each of them.

*Temperature of Air.*—Leaving out of consideration differences due to strictly local protection or exposure, we arrive at the broad conclusion that warmth is relatively greater in proportion to the distance from the North Sea. This statement applies more particularly to the winter months; for at the height of summer the heat is greater over the Continent than on the Atlantic, and the temperature ratio between the eastern and the western sections of the south coast is equalised, or may even be reversed. There is thus an alternation in kind, with the seasons, in the marine influences on temperature transmitted by the Atlantic and by the North Sea respectively.

These broad statements also apply in a much more limited degree to the comparative temperatures of the south coast stations in Kent and Sussex. It happens, however, that in this section the general law is reinforced by the accidental factor of protection. It is towards the west that local protection is more specially developed; and for this reason the more temperate stations are grouped almost exclusively in Sussex, under the shelter of the South Downs; whereas in Kent an equal degree of warmth is enjoyed only by limited spots specially favoured in their aspect, and only in the narrow interval between the shore and the cliffs.

*Sunshine.*—All the stations under consideration enjoy more sunshine than prevails inland, and the least favoured among them is better off in respect of hours of bright sunshine and of intensity of solar radiation than many places of lower latitude on the Continent. Here again, Sussex is in advance of Kent; but marked inequalities occur in connection with the oblique direction taken by the South Downs which leads to the formation of clouds at varying distances from the littoral. The particulars will be found under the various headings.

*Relative Atmospheric Humidity.*—Relative humidity is in general less along the coast than inland; but this is not true of all south coast stations as compared with their neighbouring territories, most of which have a relatively dry atmosphere. The local differences in humidity of air follow almost the same distribution as the differences in temperature. The eastern stations are relatively dry, those in the west are relatively moist; although the maximum difference between them amounts only to a few degrees.

As regards the atmospheric peculiarity usually associated with warm moisture and familiar to all under the name "relaxing," it does not belong, at any rate in a marked degree, to this region. All its resorts partake more or less, according to the prevailing influences of atmosphere, soil, and configuration, of a stimulating quality:—a circumstance which enhances the value of their climate as compared with that of others farther west.

*Rainfall.*—The instance of the Sussex Weald, where the rainfall is heavy and the air relatively dry, shows conclusively that other causes take more effect than does atmospheric humidity in determining rainfall. Nevertheless the same general tendency is noticed in this connection, as in the case of heat and



moisture, the rainfall being much more abundant in the west than in the east. Along the Sussex coast, however, the progression is a very irregular one. Indeed the general rule is reversed at the two extreme stations of Eastbourne and of Bognor. At some of the intervening stations also the amount of rainfall is regulated much more by local influences than in accordance with their relative distance from the Atlantic.

*Fog.*—Land fogs are relatively rare along the southern coast of Sussex and of Kent, especially since the improved drainage of soil.

Complete immunity from sea fogs does not exist anywhere; but their occurrence is decidedly less frequent off the Sussex coast than at the eastern extremity of the Kentish coast, where the Atlantic and the Arctic waves of temperature are apt to clash.

*Wind.*—As previously hinted, the prevalence of wind is in a large measure governed by local influences. The same breezes blow over the whole coast, but the several localities according to their aspect and to their configuration suffer more or less from each of them. With very few exceptions the southern stations are fairly protected from the north and from the east. The westerly and south-westerly winds, which largely predominate as to frequency, are also those from which there is least protection. In this connection the following remarks on seaside winds from the pen of Dr. R. L. Bowles possess great interest:—

“Enough notice is not taken of the prevailing winds at the seaside. If a place looks south it is considered perfect; but it is palpable that such places must be enfiladed by the east winds of spring, and what is, in my opinion, still worse in many respects, the strong, damp and cold winds from the west and south-west, which are much the most common on our south and south-east coasts.

“We must not forget that wind is the great cooling agent near the earth's surface and that its dampness and velocity have more effect on the animal economy than on the thermometer, *i.e.* the wind may feel and be extremely cold to the individual, whilst the thermometer indicates a high temperature. The better conducting power of an air laden with moisture, and the stealing of heat from the body as it passes swiftly by, sufficiently accounts for this; and the body having to supply fresh heat continually to the cooled surface becomes chilled and depressed. The suddenness and violence of the wind storms have also to be reckoned with.”

### **The Therapeutical Climatology of the South Coast.**

The popularity of the south coast as a residence for invalids stands out as a broad fact entirely independent of any discussion as to its merits. Whatever views may be held for or against its therapeutical value, the south coast, and in particular the Sussex coast, holds the position of the chief health resort in Great Britain. More invalids are sent there by their medical advisers, and a greater number find their way there of their own accord, than anywhere else in this country. This rooted belief in its efficacy is in itself a strong argument. It is plain that its reputation largely rests upon results and upon the physiological test of the patients' own feelings; for, in contrast with many distant sanatoria, it affords every facility for escape for those who might fail to appreciate its virtues.

We are also struck by the great variety of conditions which seek relief there and apparently find it. Few indeed are the ailments which do not at some one or other of its stations meet with favourable influences. This wide range of suitability is the outcome of the pervading characters of mildness and equability more or less shared by all its resorts. Like those safe remedies which owe their popular success to their innocuousness, the climate of the south coast seldom does harm; it is hardly capable of ever doing much harm. But its powers for good are undeniably great in the directions to be specified under the heading of "Indications and Contra-indications."

*The Climate* is, as may be inferred from the meteorological data, eminently protective. This feature is specially marked in winter; but in summer, protection of an opposite kind is also to be obtained. Therein lies the explanation of so varied a usefulness. In most conditions of delicacy, needing above all gentle measures, and the avoidance of exposure, the south coast fulfils the requirement; but discrimination is called for between two diverging classes of climates.

*The Varieties of Climate* may be grouped as the mild and the bracing. Eastbourne and Brighton, Folkestone and Dover are types of the latter class, although special localities within each of them, but especially at Brighton, Folkestone, and Dover, present a high degree of protection. Hastings and St. Leonards, Worthing



Bognor, and Littlehampton, belong to the former. Although the bracing quality of the Thanet resorts is not equalled at any of the southern stations, still within an easy distance, and often in the immediate vicinity, of most of them elevated situations may be visited which possess considerable keenness of air, to be enjoyed or avoided according to the special requirements of individual cases.

*The Special Climatic Advantages* of the south coast in general may be briefly summed up:—

(1) The marine influences, shared by a multitude of other stations, are presented by none in so comfortable a form, and combined with less collateral risk to health. (2) We find here a greater degree of protection from cold winds; (3) a higher mean temperature; (4) a smaller range of variation of temperature between the seasons; (5) a greater amount of sunshine; (6) a softer climate characterised by moderate humidity, whilst free from the reproach of being unduly relaxing; (7) a more exclusive exposure to the westerly and south-westerly winds, which are also the prevalent ones.

#### **The Indications and Contra-indications.**

*The Contra-indications.*—The smaller group is that of the affections which are not suitable for treatment at the south coast. In almost every instance the objection lies not so much in the climate itself as in the influence of the sea-air. The general contra-indications are for this reason much less sharply marked than at more northerly and especially at easterly stations.

The majority of unsuitable cases are included under three headings: (1) excessive nervous irritability; (2) excessive cutaneous irritability; and (3) the spasmodic nervous affections.

Among the first set insomnia, and asthma among the third, show great variability in the results, which are occasionally very good, but more commonly adverse.

Eczema and allied cutaneous affections are not suitable unless based upon a scrofulous habit, in which case they derive considerable benefit.

Malarial cases should not be sent to Littlehampton, Bognor, or the Romney Marsh; but at all other stations they do remarkably well.

*The Indications* include all cases of delicacy for whom adequate protection is essential, all varieties of anæmia, all kinds of physical or mental overwork, the large class of convalescents from acute affections; some forms of renal disease and of valvular disease of the heart; most diseases of the respiratory organs; the catarrhal dyspepsias, including duodenal dyspepsia—indeed all forms of dyspepsia unless combined with serious nervous excitability; and lastly, the three large groups of the most prevalent English diseases, phthisis, gout, and rheumatism, concerning which a few words are called for.

Gout and rheumatism will be benefited at the several stations in direct proportion to the amount of warmth and sunshine, to the protection from cold winds, and to the relative dryness of air.

The same remark applies, with certain reservations, to phthisis. The subject of the climatic treatment of phthisis is too wide for these pages, even though we confine ourselves to Kent and Sussex; but the relative value of the two classes of resorts, the mild and the bracing, is a question which demands some consideration, though it cannot be solved in the shape of any general statement irrespective of individual conditions and circumstances.

The days are gone by for an exclusively protective treatment of all varieties and of all stages of phthisis. In the case of many invalids this treatment must always remain a necessity, and the south coast will continue to supply the requirement. The growing feeling that something more should be looked for, and something more should be ventured in less hopeless cases, is gradually tending towards a wider utilisation of other sites, also protected, but free from any suspicion of being "relaxing." It has already been stated that none of the Sussex and Kent resorts rightly deserve that qualification. The most protected among them possess a mild element of stimulation favourable for cases of phthisis.

The same remark does not apply to all other southern stations. The conclusions drawn by Dr. C. T. Williams from the results of the climatic treatment, at various south coast stations, of 243 cases of phthisis are in general agreement with the tables drawn up by Sir George Buchanan in 1867 (cf. p. 267), in connection with the phthisis death-rate of the registration districts in Kent, Surrey, and Sussex. Dr. Williams states that "the more easterly the



station the greater is the amount of local and general improvement to be derived."

In so weighty a matter concurrence of testimony is of the first importance. The favourable results reported by Dr. R. L. Bowles in the treatment of phthisis at Folkestone during the winter months (cf. the Report on Folkestone) possess in this respect additional value. The management of phthisical patients on their return to this country after deriving benefit from a prolonged stay in the altitudes is one of the most important of our recent problems in climatic treatment. Dr. Bowles' experience in this direction is suggestive and encouraging, and bears out the remarks which have been made by the writer in connection with the medical climatology of Thanet (*q.v.*). The desideratum seems to be a combination of genial warmth, of bright sunshine, of dryness of soil and of atmosphere, and of keenness of air (*i.e.* bracing quality) with a maximum protection from wind, and if possible with the direct influence from the sea. To what extent these conditions are likely to be fulfilled at various parts of the south coast will be gathered from a careful study of the general and of the meteorological accounts given of each of the stations included in this Report.

#### DOVER.

Dover lies in lat.  $51^{\circ} 8'$  and long.  $1^{\circ} 19' E.$ , at the mouth of the River Dour, extending for some distance up the narrow valley occupied by that stream. The greater part of the town stretches east and west of the harbour, at the foot of the cliffs, and is built on the beach, from which the sea has permanently retired; it rises a few feet only above the sea level.

The climate of Dover has been studied and described with much care by Dr. Charles Parsons, and the information presented in this report is for the greater part derived from his monograph.<sup>1</sup>

*Geology.*—According to Dr. Parsons,<sup>2</sup> the greater part of the town is built upon shingle, flints, sand, &c., beneath which the chalk is found. The superficial deposit is left by the retiring sea. The main geological formation of the district is chalk.

<sup>1</sup> *Dover as a Health-Resort and Place of Residence: its Climate, etc.* By CHARLES PARSONS, M.D. Edin., Associate of King's College, London, &c. London, 1868.

<sup>2</sup> *Loc. cit.* p. 6.

The chalk strata, according to Phillips (quoted by Parsons, *loc. cit.* p. 7), forming collectively a thickness of about 820 feet, comprise :—  
 I. The chalk with numerous flints, about 350 feet thick, made up of (1) a bed with few organic remains<sup>1</sup> lying upon (2) a bed consisting chiefly of organic remains with numerous flints of peculiar forms interspersed, and a few beds of flint run along it. This bed<sup>2</sup> is termed the chalk with interspersed flints. II. The chalk with few flints. This stratum<sup>3</sup> is about 130 feet thick. III. The chalk without flints is 140 feet thick, and consists of—  
 (1) A stratum 90 feet thick, containing numerous thin beds of organic remains. (2) A stratum 50 feet thick, with few organic remains. IV. The gray chalk. This is estimated to be not less than 200 feet in thickness.

Further data are supplied by Mr. Pugin Thornton, of Canterbury :—"The Channel Tunnel scheme has proved the existence of a large coalfield below this coast. It is estimated by Mr. Francis Brady, C.E., that the supply of workable coal will be equal to nearly 80,000,000 tons, giving over 600,000 tons per annum for 133 years, purchasable at the pit's mouth at seven to eight shillings a ton. This coal is found at a depth from 1,180 to 2,220 feet below the surface, the seams amounting to nearly 20 feet in thickness. By analysis the coal of the lower seams has been found to be equal to the Radstock in Somerset, and superior to samples of Welsh coal required for the Navy.

"Mons. M. R. Zeiller, lecturer on vegetable palæontology to the School of Mines in Paris, has found numerous fossil imprints in the Dover coalfield. Calamophyllites, Lepidodendron, &c., from the upper seam coal, and Nevropteris rarinervis and Nevropteris Scheuchzeri from coal of 1,900 to 2,038 feet levels. Mons. Zeiller concludes, therefore, that the Dover coalfield cannot be more recent than the beds of Radstock, or more ancient than the deepest beds of the upper zone of the Pas-de-Calais.

"The Dover boring traversed the following strata : 174 feet, gray chalk and chalk marl ; 8 feet, chloritic marl ; 121 feet, gault ; 241 feet, lower greensand, wealden and Hastings beds ; 613 feet, upper, middle, and lower oolites, &c., with lias at the bottom ; 773 feet, coal measures with eight workable seams, containing 16 feet of

<sup>1</sup> This forms the principal part of the Western Heights and Castle Cliff.

<sup>2</sup> Includes the upper portion of Shakespeare's Cliff and the range west of it.

<sup>3</sup> The lower portion of Shakespeare's Cliff and adjoining cliffs to the westward of it.



bright bituminous coal. This coal is found, after passing through other strata of inferior qualities, at a depth of 2,100 feet below the surface, and has 25 feet of working with a horizontal stratification, showing that the tunnel was commenced over the centre of the coalfield. Such an event bids fair to greatly alter the climatology of this region, which would then be the 'Black Country' of Kent.

"The cliff between Dover and St. Margaret's Bay having lately fallen to the extent of many tons, it is hoped that during this year (1895) a Bill will be passed through Parliament for the preservation of this portion of the coast by escarping the cliff and making a road along the whole distance.

"Such a work on the eastern side of Dover," suggests Mr. Thornton, "would constitute a small Riviera, and help to modify the evil climatal influence of the coalfields on the western side."

"The following extract from the *Globe* newspaper for February 5th, 1895, refers to the landslip which occurred on February 3rd:—

"An inspection of the cliff between Dover and St. Margaret's shows that an enormous slip has taken place—the largest subsidence of coast cliff, in fact, which has occurred for many years. When it happened, a dull roar was heard in the distance, followed by a cloud of dust from the débris, which blew across Dover Bay almost like a sea fog. There is every appearance that when the frost breaks further slips will occur, as there are several places along the cliff where there are great cracks on the top as well as in the face of the cliff. One is right in front of the convict prison (now empty), which in course of time, as well as the South Foreland Lighthouses and the Cornhill Coastguard Station, must stand in great danger of slipping into the sea, unless some measures are taken for the protection of the fore-shore.'

"In Parliament, on March 12th, 1895, the Government proposed to vote 1,920,000*l.* for the construction of a 527-acre torpedo-proof naval and mercantile harbour at Dover, on the plan of the 1844 Commission, one and a half miles across and a mile from shore to southern entrance, another entrance being on the eastern side. It will extend from the Admiralty Pier to beyond the prison, and will enclose the present harbour extension of 57 acres, which is being built for the town by the well-known contractor Sir John Jackson."

*Aspect, Exposure, and Protection.*—Dover faces south, and the greater number of the residences usually recommended for

invalids occupy favourable sites. The long ranges of houses on the beach, from East Cliff on the one side to the Esplanade on the other, including Marine Parade and Waterloo Crescent, look nearly due south, or rather south by east. Some few houses at the western extremity following the curve of the bay have their frontage a little more easterly, and consequently lose the sun's rays earlier in the day than the others.

Dover is flanked and fully protected in the rear by the rising heights of the chalk range. On the north-east lie the South Foreland and the hill on which Dover Castle stands. The latter immediately overhangs the houses at East Cliff, and is at this point about 340 feet high, whilst near the Turnpike it is at least 50 feet higher, and reaches to 390 feet. This range of hills opposes an efficient barrier to the keen penetrating winds which blow from the north and north-east during the winter and early months of spring, whilst on the western flank the Western Heights and the Alkham range afford ample protection from the northern and north-westerly blasts. In fact, it is no uncommon sight during the prevalence of north and north-easterly winds to see the bay dotted with vessels of every kind, riding peacefully at anchor under the shelter of the South Foreland cliff, whilst the sea beyond is covered with white-crested waves. The walk beneath this cliff along the beach is so sheltered that even a piercing north-east wind of considerable force is wholly unperceived by the loiterers on the shingle and rocks below; and should the day be bright and the sun shining the temperature is not surpassed even by the "Undercliff" of the Isle of Wight.

At East Cliff, where the houses are overhung by the rocks in the immediate background, the heat is not excessive in the summer, whilst in the winter the shelter afforded by the cliffs renders these houses most desirable residences for invalids with chest affections, for they are entirely protected from the north and north-east winds, and are only open to south-south-east and south-west. Doubtless, in summer the chalk strongly reflects both light and heat, but the greater the surface which is heated the greater the cool breeze which streams in from the sea to fill the vacuum occasioned by the rarefaction of the air by the heated cliffs.

*The Climate of Dover* is described by Dr. Parsons as bracing, tonic, and dry, less mild than that of St. Leonard's, less keen than



that of Brighton. It varies with the season in the following way:—

December, January, February, March	...	...	Cold.
April, May	...	...	Temperate.
June, July, August	...	...	Hot.
September, October, November	...	...	Mild.

The hottest month is July. January is the coldest. With the exception of January and March the winter is quite temperate.

"The town of Dover is built so near to the level of the sea as to be only a few feet above high-water mark, and is therefore fully exposed to the benign influence of the breezes that sweep the surface of the straits.

"It is pretty well understood that the temperature of a locality is regulated in a great degree by its elevation above the level of the sea—the greater the height the greater the cold, and *vice versa*. It has been calculated that for every 300 feet of altitude the mean temperature is diminished one degree . . ." (*loc. cit.* p. 9). The suggestion lies near that "Residences that might be built at higher levels on the cliff would probably possess a climate as bracing as that of Brighton." (*Loc. cit.* p. 29.)

*Winds.*—The town is entirely open towards the south south-east and south-west, and fully exposed to the gales which blow from these quarters. They, however, are warm winds coming directly over the sea, at once refreshing, invigorating, and conducive to health and enjoyment.

The easterly winds which prevail during March render Dover an undesirable residence at that time.

The cold and dry north-east wind of spring sets in about March or April. Neither this nor the south-west wind is of constant duration in consecutive years, and the character of the climate of any given year greatly depends upon the predominance of the one or of the other.

Mr. Glaisher, in a paper published in the Proceedings of the British Meteorological Society, gives the average number of days of each wind, as found from observations extending over a period from 1841 to 1860, referred to eight points of the compass, as follows:—

From the South-west	...	...	...	...	...	104 days.
" North-east	...	...	...	...	...	48 "
" North	...	...	...	...	...	41 "
" West	...	...	...	...	...	38 "

From the South	...	...	...	...	...	...	34 days.
" North-west	...	...	...	...	...	...	24 "
" East	...	...	...	...	...	...	22 "
" South-east	...	...	...	...	...	...	20 "
Calm	...	...	...	...	...	...	34 "

The south-west wind appears to be the most constant throughout the year, bringing warmth and moisture to us for eight months.<sup>1</sup>

*Humidity.*—Dover is exposed to sea fogs, which are known to be not infrequent in the Channel.

The rainfall as compared with that of other towns on the south coast of Kent, Sussex and Hampshire is of average amount; but the number of rainy days recorded in the table below and that on p. 490 is much less than at other stations with similar rainfall. The rain freely penetrates the gravelly soil; and even after a heavy shower the ground so quickly dries that invalids may walk about.

The air may be regarded as dry.

TABLE SHOWING THE RAINFALL AT DOVER FOR SEVEN YEARS (1860-66).<sup>2</sup>

	1860.	1861.	1862.	1863.	1864.	1865.	1866.
Quantity of Rain ... ..	Inches. 36·25	Inches. 28·41	Inches. 25·93	Inches. 26·31	Inches. 23·04	Inches. 38·03	Inches. 36·95
Number of Rainy Days ...	120	100	110	85	75	109	106

*Drainage.*—Before 1853 there was no regular system of drainage; cesspools abounded; few drains or sewers existed. The new sewerage is described in the Report to the Privy Council for 1866:—

"The plan of sewerage has been to retain the old sewers to carry off the storm-water, but to divert from them all soil-drainage into a new system of pipes, discharging into the sea at low-water by gravitation. Arrangements are also made for pumping it during high-water and the spring tides. Water-spouts are left untrapped when in safe situations, to serve as ventilators. At the summit of every sewer a flushing well is constructed which can be filled from the water mains.

<sup>1</sup> It is suggested to the Reporter that Dover is liable to draughts of wind, the latter when blowing from certain quarters being locked in by the cliffs.

<sup>2</sup> *Vide* C. Parsons, *loc. cit.* 17, 18.



TABLE SHOWING THE RAINFALL AT FIVE STATIONS ON THE SOUTH COAST.<sup>1</sup>

NAMES OF STATIONS.	1860.		1861.		1862.		1863.		1864.		1865.		1866.	
	Number of Rainy Days.	Amount of Rainfall.	Number of Rainy Days.	Amount of Rainfall.	Number of Rainy Days.	Amount of Rainfall.	Number of Rainy Days.	Amount of Rainfall.	Number of Rainy Days.	Amount of Rainfall.	Number of Rainy Days.	Amount of Rainfall.	Number of Rainy Days.	Amount of Rainfall.
Ventnor ... ..	183	Inches. 36·2	153	Inches. 27·4	153	Inches. 30·0	144	Inches. 27·7	140	Inches. 22·0	156	Inches. 32·7	No returns	Inches. 31·3
Bournemouth ... ..	No returns		No returns		162	28·5	108	30·3	102	21·7	116	33·1	147	31·3
Worthing ... ..	173	34·5	No returns		195	32·9	169	28·7	142	24·3	161	34·7	172	31·0
Brighton ... ..	No returns		287	23·3	2112	27·5	118	27·1	113	23·2	152	36·4	No returns	
Dover ... ..	120	36·25	100	28·41	110	25·93	85	26·31	75	23·04	109	38·03	106	36·95

<sup>1</sup> Vide C. Parsons, *loc. cit.*, pp. 17, 18.<sup>2</sup> June omitted.<sup>3</sup> July omitted.

*Water Supply.*—The water supply of Dover is mainly furnished by the works of the Local Board, constructed in 1853-56, from two communicating wells sunk into the chalk, 226 feet deep, with an adit of 250 yards, driven horizontally to intercept springs in the chalk. 7,500,000 gallons was the amount raised per week (in 1868), giving the copious allowance of forty-eight gallons per head per day to the houses supplied. The following is the report of Dr. Letheby upon a specimen of the Dover water submitted to him for analysis by the Local Board, on September 19th, 1866:—"It was remarkably bright and clear, and was free from all trace of organic matter. The composition of the water per imperial gallon was as follows, and for comparison there is added the composition of water supplied to London:—

Constituents.	Dover Water.	Kent Water.	New River.	Thames River.
	grs.	grs.	grs.	grs.
Carbonate of lime and magnesia ... ..	13·75	14·10	12·08	11·10
Sulphate of lime ... ..	2·42	5·74	1·82	4·78
Alkaline chloride ... ..	0·92	2·27	1·54	1·88
Alkaline nitrate ... ..	4·25	1·93	1·18	1·96
Silica and alumina ... ..	0·67	0·97	0·46	0·72
Organic matters ... ..	no trace	0·26	0·56	0·80
Total per gallon ...	22·01	25·27	17·54	21·24
Hardness before boiling ... ..	17 deg.	19 deg.	15 deg.	15 deg.
Do. after boiling ... ..	6½ ,,	7 ,,	5 ,,	6 ,,

"These results show that the water is of excellent quality, and that from the circumstance of its being absolutely free from organic matter it is especially well suited for domestic use and for a town supply. It was further ascertained that the water was entirely without action on lead, and therefore might be safely stored in lead cisterns, or distributed by lead pipes. My conclusion is, that I have rarely examined a water so free from organic matter, or better suited for domestic purposes."

It is clear that Dover enjoys the inestimable privilege of an abundant supply of water of acknowledged excellence and purity.

*The Public Health of Dover.*—The following facts are derived from Dr. Robinson's Report<sup>1</sup>:—

<sup>1</sup> *Report to the Sanitary Authorities of the East Kent Joint Committee for the Year 1891.* By M. K. ROBINSON, M.D., the Medical Officer of Health. Dover, 1892.



The Dover Borough Urban Sanitary District, with an area of 1,317 acres and a population—Census (preliminary) 1891—of 33,418, showed during 1891 a birth-rate of 28·0 per thousand, and, after correction for the workhouse, a death-rate of 15·5.

Of the aggregate number of deaths (537) 54 were due to pulmonary phthisis, 110 to various diseases of the lungs, 53 to heart disease, 22 to injuries, 8 to influenza, 5 to pertussis, 5 to diarrhoea, 3 to croup, 2 to enteric fever, 1 to scarlatina, 1 to diphtheria, and the remaining 273 to various other causes.

The death-rate from the chief zymotic diseases was only 41 per 1,000 of population. 101 of the deaths were those of infants under one year of age; 196 occurred at upwards of sixty years of age, being 36·4 per cent. of the total deaths. The infant mortality was at the rate of 10·7 per cent. of the births.

The majority of deaths from pulmonary affections occurred during the first quarter of the year.

In the Dover Rural Sanitary District, with an area of 27,974 acres, and a population (Preliminary Census, 1891) of 7,061, the birth-rate was equal to 28·1, and the death-rate, after correction for the mortality of rural subjects in the workhouse, 14·4 per 1000. Twenty-six deaths (including 4 from consumption) were attributed to diseases of the lungs, 9 to heart disease, 9 to injuries, 2 each to measles and whooping-cough, and the remaining 37 to old age and various other causes. The death-rate from the chief zymotics was 0·5 per 1000 of the population. Infant mortality in proportion to births registered was at the rate of 9·0 per cent.

*Special Report on the Occurrence of Diseases, and the Effects of the Climate.*

Dr. Parsons writes:—"It cannot be said that any one disease prevails here. Stone in the bladder, which one would think (having regard to the hard water) would be very common, is singularly absent and rare! Old age is common enough, and the health of old people has always seemed to me to be unusually good in this place."

*Therapeutical Indications.*—The climate of Dover is held by Dr. Parsons to be beneficial in the treatment of the following conditions:—(1) *Strumous* affections of children, abscesses, rickets, softening of the bones, joint diseases, but the stay must be pro-

longed. (2) Early *phthisis*. (3) *Chronic bronchitis* in the young, or in adult age. (4) *Dyspepsia* in all its forms benefits largely from the dry and bracing air. (5) *Chronic diarrhoea* and *dysentery* are always alleviated, probably owing to the peculiar character of the water. (6) *Sleeplessness*.—Dr. Parsons draws attention to the immunity from insomnia observed by him among the residents, and to the drowsiness of which many visitors complain shortly after their arrival.

*Contra-indications*.—By Dr. Parsons the climate of Dover is held to be unsuitable for—(1) Advanced *phthisis*. (2) The *chronic bronchitis* of the aged, for whom a warm and moist climate is indicated. (3) *Rheumatism*, except in the summer.

*Mortality*—Dr. Parsons remarks (*loc. cit.* p. 22), "It may be stated generally that the country south of the Thames is the healthiest, and that fewer deaths occur in Kent, Surrey, Sussex, Hampshire and Berkshire, than in any other part of England. . . . It is curious to observe how frequently the death-rate augments with the increased prosperity of a community."

#### FOLKESTONE.

The town of Folkestone, numbering about 24,500 inhabitants, lies near the extremity of a range of chalk cliffs which extend all the way from Dover. The chalk downs which run into the cliffs are continued behind the town, at a distance of about two miles from it, ending as we have elsewhere described.

The situation of the town on the cliff, and the fact that the latter projects slightly at this spot from the coast line, lays it open to considerable ventilation from the sea, whilst the high chalk range at its back excludes a great part of the colder land-winds, especially those blowing from the north. The aspect is sunny towards the south and south-east. The town is better planned than many other seaside resorts. The absence of long terraces, the houses mostly detached or semi-detached, each having a brightly planted garden of its own, the trees planted along most of the roads and avenues, are features which add a picturesque charm to the town scenery. The houses on the lower parade under the cliff offer a more sheltered climate to those needing it, and the hydraulic lift enables invalids to vary the altitude of their



walk without walking uphill—a few seconds sufficing for the journey between the new Promenade Pier and the Lees.

The sea at Folkestone is remarkably clear, owing to the shore being pebbly rather than sandy. The sea-bathing is good; new and well-arranged bathing-houses, running on rails, having to some extent superseded the older bathing-machines, and there is also a well-fitted bathing establishment.

The country around Folkestone is varied and picturesque, with many charming walks and drives. The Warren, too, from the variety and beauty of its flora and fauna, and the richness of its strata, affords abundant material for members of the Natural History Society and others.

There is good provision for athletic amusements, such as riding cricket, and tennis, nearly every house having the use of some tennis-ground. The golf links, with a course of three miles, are within half a mile of the town. The boating is good, and there are great facilities for excursions to the Continent, owing to the service of steamers which cross twice daily to and from Boulogne.

*Geology.*—Folkestone and Sandgate both occupy the south-eastern extremity of the narrow belt of Greensand which surrounds the Weald of Kent and of Sussex. They owe to the porous nature of this formation a comparatively dry and a very healthy climate, and an additional facility for drainage, which in the case of Folkestone is rendered particularly easy by the altitude of the greater part of the town. Roads dry immediately or soon after a rainfall; and mists, damp, and fog are almost unknown, sea-fogs being excepted. Even from the latter the altitude of the cliffs affords considerable immunity.

*Climatology.*—Much evenness of temperature is claimed for Folkestone, the neighbourhood of the sea lending it a coolness in summer and in winter a warmth which do not belong to inland places. That these advantages are mainly due to the influence of the Gulf Stream and to its immediate vicinity to the coast hardly needs to be stated.

Dr. Charles E. Fitzgerald made the following observations on the temperature, for the six winter months, of a room without fire, the thermometer being by an open window, and in a fairly exposed situation, the time of reading being daily at 2 P.M. He considers this a better test of the climate an invalid would

experience in a winter sojourn in Folkestone than that of the temperature of the open air, which, however, may be taken as an average at three or four degrees below the figures quoted.

Thermometer in room :—

		Max.	Min.	Average.
1888.	October ... ..	67°	55°	62°
	November ... ..	63°	50°	58°
	December ... ..	60°	47°	54°
1889.	January ... ..	55°	47°	51°·5
	February ... ..	56°	47°	54°
	March ... ..	57°	46°	52°·5

The range was thus :—

12	degrees in October.
13	„ November and December.
8	„ January.
9	„ February.
11	„ March.

*Sunshine.*—Folkestone enjoys, in addition to a sunny aspect, a good deal of sunshine. Dr. Fitzgerald<sup>1</sup> (*loc. cit.* p. 3), reports that during the winter 1888–89 the sun shone on 105 days; but the duration of sunshine was not given. There is hardly a day in the winter season when a sunny walk may not be taken on the Lees and along the sheltered paths in the cliff, open to the full noontide sun, and screened from cold inland winds.

*Rainfall.*—As regards rainfall, Folkestone is favoured. Although below the average, its amount is amply sufficient. It is but rarely that rain lasts throughout the day. Dr. Fitzgerald's observations (*loc. cit.* p. 4), show that during the six winter months 1888–89 rain fell on 53 out of 182 days. In London rain fell on 79 days, representing a percentage of 43·4, and a monthly average of 13·1 days—rainy days, against a percentage of 27·1, and a monthly average of 8·8 for Folkestone. The following table drawn up by Dr. Fitzgerald<sup>2</sup> shows the number of days in which the rain fell during six months 1888–1889 at various places :—

<sup>1</sup> *Folkestone as a Health Resort.* An Address by Chas. E. Fitzgerald, M.D. &c., read at the Annual Summer Meeting of the Association of Public Sanitary Inspectors of Great Britain. Sept. 4th, 1889.

<sup>2</sup> *Ibid.*



Rain fell at Folkestone on 53 days			Percentage in the six months.	Average in one month.
			29.1 per cent.	8.8
"	London	79	43.4	13.1
"	Barnstaple	79	43.4	13.1
"	Bath	83	45.6	13.8
"	Carlisle	89	48.9	14.8
"	Bradford	89	48.9	14.8
"	Eastbourne	98	53.8	16.5
"	Plymouth	102	56.0	17.0
"	Torquay	104	57.1	17.3
"	Isle of Wight	104	57.1	17.3
"	Llandudno	108	59.3	18.0
"	Liverpool	111	60.9	18.5
"	Truro	115	63.1	19.1
"	Salisbury	121	66.4	20.1

In Symons's *British Rainfall* 1891, the returns for 1891 (a very wet year) are 29.46 inches and 29.56 inches, against 20.37 inches at Leyesdown, Sheppey, 22.41 at Gravesend, and 25.04 at Greenwich.

The table is interesting as showing the greater frequency of rain in the Isle of Wight and farther down the Channel to the west. There is also an instructive contrast between Folkestone and Eastbourne, which occupy symmetrical positions at the two extremities of the coast line formed by the Hastings' Sands. The paucity of rainy days probably means that small rainfalls occur elsewhere which only threaten Folkestone, the clouds passing onwards towards Dover.

Various reasons might explain this peculiarity. The configuration of the coast is such that a west wind would have to traverse the whole region of the Hastings' Sands, and a wind from west-south-west would travel over the entire coast from Brighton or Newhaven, before leaving, Folkestone; in the second place clouds laden with moisture would be more likely to burst on the colder side of the chalk downs than on their sea aspect. Lastly, it is more than probable that the nature of the soil has some influence in delaying rainfall: at times when the atmospheric moisture is finely balanced, Folkestone may escape many a slight shower merely because the lower strata of a west wind travelling over the sandy weald are slightly dried by the moisture-absorbing sand, which is also a warmer soil because possessing greater absorption for heat than the chalk lying eastwards of the town.

The late F. C. Sawyer in his interesting review of the Climatology of Sussex dwells on the fact that the Weald has a considerable rainfall though its air is dry; and that Beachy Head influences the

rainfall of Eastbourne by directing a portion of the clouds from the south-west over the town. Folkestone, farther east, would be benefited by this circumstance.

The meteorological table on page 498 is contributed by Dr. Charles F. Fitzgerald, of Folkestone. N.B.—The observations of temperature were taken daily at noon, the thermometer being in a room without fire and by an open window—in the shade. (Open-air temperature 8 degrees colder in winter.) The barometer stands at an elevation of some 100 feet above the sea, and has not been reduced to sea-level—the readings may therefore be reckoned as .2 or .3 higher.

## FOLKESTONE METEOROLOGICAL CHART, 1892.

(From the Report of the Medical Officer of Health for 1892.)

MONTH.	Mean.	Max.	Min.	Mean Max.	Mean Min.	Mean Daily Range.	Rainfall.
		Absolute.					
January ... ..	36.0	53	18	41.9	30.9	11.0	0.85
February ... ..	40.0	54	23	45.6	34.3	11.2	2.88
March ... ..	38.3	58	18	44.7	32.0	12.6	2.81
April ... ..	47.5	70	30	56.1	38.9	17.2	1.60
May ... ..	53.9	77	32	63.6	44.6	19.0	0.37
June ... ..	58.1	84	42	66.7	49.5	17.2	2.46
July ... ..	60.7	79	45	68.8	52.6	16.0	1.96
August ... ..	55.8	79	47	57.4	54.1	3.4	3.77
September ... ..	58.6	72	38	66.5	50.7	15.8	2.49
October ... ..	47.7	63	29	55.3	40.1	15.1	6.28
November ... ..	47.9	62	30	53.6	42.2	11.3	4.37
December .. ..	36.6	57	23	41.6	31.6	10.0	2.87
Mean of Year ...	48.4	—	—	—	—	13.3	32.72

*Special Report on the Prevalence of, or Immunity from, Diseases.*  
By Dr. R. L. Bowles, F.R.C.P.

A. *Anæmia* common amongst lodging-house servants, probably from overwork, long hours, and little sleep rather than from locality.

B. *Scrofula and Tuberculous Diseases* exceedingly rare. I once examined all the children in the National and Board Schools on a particular day for enlarged glands or other marks of scrofula, and arrived at the above conclusion. The exact proportion I am

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not able to state as I cannot at the moment find my papers, nor do I know what would be the relative proportion in other towns.

C. *Diseases of the Respiratory Organs*.—Phthisis amongst the natives in good circumstances is most rarely to be found, and I feel sure that in a less degree the same holds good amongst the poor.

Formerly I was most anxious that phthisical patients should not winter in Folkestone; but of late I have gained courage from the fact that many patients who have wintered abroad both in the Riviera and at Davos for several seasons have done better in Folkestone. Some of the Davos cases have become permanent residents: one lady gained a stone in weight in one winter and remained perfectly well.

Catarrhs are, I think, common and probably due to the chilling influence of the cold, damp, and high south-west winds which often prevail. Bronchitis *extremely* rare, except perhaps amongst the children of the poor. I have gone year after year without seeing more than a case or two of true bronchitis. In influenza years I saw four or five cases only each year amongst the better classes.

Pneumonia is decidedly uncommon. Pleurisy less uncommon. Asthma I think rather common; and visitors liable to this malady would often have attacks soon after arrival, and only get well on their departure.

D. *Renal Diseases*.—Acute renal dropsy very uncommon, probably from the almost complete absence of scarlatina for many years past. Chronic albuminuria uncommon, except amongst visitor patients.

Calculus and gravel very uncommon. This has often struck me as contrary to what is usually considered common in chalky districts.<sup>1</sup>

E. *Attacks of Acute Rheumatism* are uncommon, and the same may be said of chronic rheumatism and rheumatoid arthritis; but neuralgiæ are common, arising, I think, chiefly from the sudden and violent changes of wind and weather, especially the damp winds of the south-west.

F. *Eczema* may be somewhat common and difficult of cure. In summer children of visitors are very liable to Lichen urticatus after being much on the beach.

<sup>1</sup> Cf. Dr. Parsons' remarks, "Dover."



G. *Endemic Diseases*:—*Malarial affections*.—Unless some of the neuralgias may be tinged with malaria by the winds which have passed over Romney Marsh, which I do not think is the case, there are none. *Typhoid fever*.—With the exception of two localized outbreaks proved to demonstration to have arisen from a broken sewer tainting a particular spring of usually beautiful water, it may be said to have been absent for many years from the town, whereas before the main drainage was perfected and the water supply more cared for it was a common disease. *Diarrhœa*.—Of late years *most* uncommon, whereas formerly it was looked upon as a summer harvest by the doctors; this disease has disappeared with typhoid fever. *Scarlet fever*.—For ten or twelve years I only saw four cases, and two of those were known to be imported, and doubtless the other two were also. For the last year or two there have been many cases in the sanatorium, but all of a mild type. *Diphtheria* has appeared from time to time and been very troublesome to trace in its origin and progress; and it is most unsatisfactory to observe that it often appears even in apparently healthy environments. The same may be said of endemic sore throats. In an inquiry of this kind, one cannot but feel painfully conscious of the impotency of the individual in arriving at anything like scientific conclusions; he can only generalize, and even then he will necessarily be influenced in various ways even against his will—for example, by local patriotism; by self-interest; by the nature of the practice in which he has been engaged, whether amongst the rich or the poor, and whether he sees few or many patients; by the interest he has taken in particular subjects and the absence of that interest in others; by the carefulness or the reverse with which he has made his observations. The man who has seen “lots of this” or “very little of that” is scarcely to be trusted in matters of science. Still, after a sufficient number of years, personal experience must be of some value, and from that point of view I have for some time tried to arrive at a result which would be judicial and general, and I think what I have now stated may be fairly trusted in that sense.

Dr. Charles E. Fitzgerald's report agrees on all essential points with the foregoing: In phthisis “the climate is better adapted for the initial stage.” Pneumonia and pleurisy are rare. In asthma the climate is too bracing, except in very exceptional cases. Acute

renal dropsy and calculus and gravel are of average occurrence; also rheumatic affections and neuralgiæ.

No malaria; diphtheria rare; diarrhœa occasional.

The drainage is of modern type, with very occasional shaft ventilation outside the soil pipe.

*Report on the Sanitary Condition of Folkestone during the year 1892.*

*By M. G. Yunge Bateman, M.R.C.S., L.S.A., D.P.H. (Cantab.),  
Medical Officer of Health.*

The report shows a birth-rate of 25.55 and a death-rate of 16.04 in an estimated population of 24,500. Deducting 23 deaths of visitors, the corrected death-rate would be 15.10.

BIRTH AND DEATH RATES FOR THE LAST FIVE YEARS.

	Birth-rate.	Death-rate.
1888	26.78	13.17
1889	26.10	13.8
1890	25.08	13.8
1891	26.08	13.3
1892	25.55	15.10

Influenza, and bronchitis and pneumonia due to influenza, and an increase in the deaths due to zymotic diseases, were the chief causes of the recent rise in the death-rate, the zymotic death-rate being 1.4 against .5 for last year.

The deaths due to the principal zymotic diseases are seen in the following table:—

	1892.	1891.	1890.
Smallpox ... ..	0	0	0
Measles ... ..	0	0	6
Diphtheria ... ..	13	5	0
Whooping Cough ... ..	3	2	10
Typhus ... ..	0	0	0
Fever, Typhoid ... ..	0	2	4
„ Simple Continued ... ..	0	0	0
Diarrhœa ... ..	14	4	3
Scarlet Fever ... ..	6	0	1
Total ...	36	13	24

*Common Causes of Death*, in order of frequency:—(a) All other diseases: (b) Bronchitis, pneumonia, pleurisy; (c) Phthisis: (d) Heart disease.



*Frequency of Old Age.*—Most deaths occur in the column marked "60 and upwards."

*The System of Drainage* is the combined water carriage system. The gradient is good, and ensures an efficient flush; but the ventilation of the sewers might be improved, and is now under consideration. The outfall is into the sea to the east of the town, and is tide locked at certain hours of the day. The outfall pipes are to be carried 250 feet into the sea, from the end of the 6 feet by 4 feet sewer at the end of the East Pier, the present outfall pipes being only 72 feet.

*The Water Supply.*—The water comes from waterworks situated about one and a half miles out of the town at the foot of the chalk downs, principally from a deep well (90 feet) in the lower greensand, which yields 800,000 gallons per diem. It is thence pumped to two reservoirs, and delivered to the town by iron pipes. One district, having its centre in the lowest part of the town and with a radius of 2,000 feet from that centre, has a constant supply, the rest of the town an intermittent supply.

#### SANDGATE.

(For particulars contained in this Report the Reporter is indebted to the kindness of Mr. W. L. Chubb, M.R.C.S., Medical Officer of Health.)

Sandgate is a narrow village, over a mile in length, running from east to west. Most of its houses face the sea, and enjoy a southern aspect. It is well protected by tall cliffs at the back from north, north-west and north-east winds. Folkestone lies on the cliffs to the east, and Shorncliffe Camp on well-wooded hills to the north. Nights in summer almost invariably are cool.

It is about one and a half miles from Folkestone, and nearly at the same distance from Hythe. The walks and drives in the neighbourhood are numerous and charming. Shorncliffe Camp is on the cliffs at the back, and takes about fifteen minutes to reach. Here a light bracing atmosphere can be enjoyed in fine weather, but owing to the more exposed situation, the temperature is much cooler than at Sandgate, during the prevalence of the north and north-east winds. The average difference in temperature between the two stations is said to be 3°.

The prevailing winds are the south-west, west, and north-west which are said to blow on an average for 196 days, the north and east winds blowing for 107 days.

The rainfall is upwards of thirty inches annually, but the light sandy soil readily absorbs the moisture, and, continuous rain being the exception, invalids are rarely confined to the house for the entire day.

In addition to its equable temperature, Sandgate prides itself on its amount of sunshine and its considerable immunity from sea-fogs which are said to cling in preference to the hills at the back of the town.

The "Beach Rocks" Convalescent Home is doing excellent work in connection with convalescence from various diseases, and with phthisis.

*The Prevalence of, or Immunity from, Disease.*

A. *Anæmia and Debility*.—Rather prevalent amongst young girls employed as servants (even where hygienic surroundings, &c., are favourable), and girls employed as dressmakers' apprentices. Rare amongst better classes. Improves rapidly under treatment. Patients are decidedly benefited, a large number of such cases being sent to the Convalescent Home.

B. *Scrofula and Tuberculous Diseases*.—Practically unknown among residents. Cases sent down improve rapidly, almost invariably.

C. *Diseases of Respiratory Organs*:—*Phthisis*.—*Very rare* among residents born in Sandgate. People coming to live here, in whom there is a constitutional tendency, occasionally develop disease, especially if living with unhygienic surroundings. The disease generally runs a chronic course. Hæmoptysis infrequent.

The climate as a rule admirably suits phthisical patients sent here. Amongst 300 to 400 patients sent to the Convalescent Home annually (mostly from Brompton), improvement as a rule takes place in 90 per cent.; many improve very markedly, gaining 4 to 5 lbs. or more in a month. Attacks of hæmoptysis occasionally occur in those who have had it before, but is rare as a new symptom. Patients would do even better if they took more care of themselves when they first arrive.



*Bronchitis and Catarrh.*—Of average frequency in old subjects. The climate seems to suit such cases well, the protection from north and north-east winds allowing patients to get out more frequently than in places not similarly protected.

*Pneumonia.*—Acute pneumonia rare. *Pleurisy.*—Of average frequency, all such cases coming under my notice have done well. *Asthma.*—Very rare among residents. Those sent here seem to have as many attacks here as elsewhere, but my experience is not large of such cases.

*D. Renal Diseases:*—*Acute Renal Dropsy.*—No case. *Chronic Albuminuria.*—Very slight experience of these cases. *Calculus and Gravel.*—I can recall four cases in six years—two men, one woman, one child.

*E. Rheumatism*—Acute rheumatism rather rare among residents, and I cannot remember a visitor being attacked. Subacute and chronic rheumatism with disordered liver rather prevalent; more particularly among residents. *Neuralgia.*—Of average frequency. *Rheumatoid Arthritis.*—A few such cases, not often a severe form.

*F. Diseases of Skin.*—Such diseases are uncommon, eczema being most frequent, and as a rule rather intractable.

*G. Endemic Diseases:*—*Malarial affections.*—Unknown among residents or visitors, unless the latter have come from malarial district. *Typhoid Fever.*—Two cases in six years, both imported. *Diarrhoea.*—Very little diarrhoea among residents or visitors. *Scarlet Fever.*—Rare. About six cases in six years. *Diphtheria.*—Two epidemics in the last six years: (1) September—February, 1888-1889: Started by a visitor's child just come from London from infected house, and carried to other houses by personal contact. Many cases; severe form. (2) December—January, 1890-1891: Presumed to have originated at national schools, where sanitary arrangements were found to be very defective; mild form, with few constitutional symptoms. No fresh cases since schools were closed. Drainage has since been attended to, and is now in perfect order. I have never seen a sporadic case here. *Endemic Sore Throat.*—Occasional cases seen among residents, and rarely among visitors.

(1) *The Common Causes of Death:*—1. Phthisis; 2. Heart disease; 3. Gastro-intestinal affections; 4. Broncho-pneumonia;

5. Pneumonia. Deaths, from all but 3 and 4, largely augmented by patients at Convalescent Home and visitors.

(2) *Frequency of Old Age among Permanent Residents.*—A large number of residents reach a good old age. I am acquainted with two of over ninety years and many between eighty and ninety.

*The System of Drainage.*—New drains are at present (May, 1891) being constructed, the old drains having been laid forty years ago. The system is by gravitation aided by flushing apparatus and outlet from sewage chamber at certain states of the tide into the sea. Ventilation is well attended to. An endeavour will be made to have lodging-houses inspected and registered when connection with the new main has been effected.

*The Water Supply.*—Spring water from three sources: (1) Honeywood Spring supplies the greater part of Sandgate, and is an excellent water: the spring rises about  $1\frac{1}{2}$  miles from the place; (2) Brewers' Hill Spring; (3) Castle Hill Spring.

All these waters are good, and have very satisfactory analyses.

#### HYTHE AND THE ROMNEY MARSH.

(The Reporter is indebted to Dr. R. L. Bowles, F.R.C.P., for these notes.)

"Hythe is situated in a beautiful bay at the sea-level at the foot of the hills on which Lympne stands. It is very pretty, and is rapidly growing in importance; it has a fine new hotel, the Seabrook Hotel, and many new moderate-sized and commodious houses quite on the sea-beach, a bathing establishment and bathing machines; there is also a canal running through the Marsh, on which boating is enjoyed.

"Situated on the edge of the Marsh there are from time to time mild agueish illnesses not very defined, but disappearing only on the liberal administration of quinine; but these really are not common, and I think never to be feared by visitors in the summer season. The drainage is fair, but the authorities are busy about improving it.

"Romney Marsh generally is not now at all like a marsh, a mere rich agricultural flat, intersected by ditches; the seaboard (Dymchurch, Dungeness, &c.,) is more or less a shingly desert, but in many ways interesting; West Hythe is just at the edge of the



Marsh under the heights of Lympne Castle, and is a village of no importance.

"With the exception of Hythe, none of these places can be called bathing or winter stations; but Littlestone-on-Sea, between Dungeness and Dymchurch, is becoming attractive for its golf links, and new houses are being erected there."

**The Hythe Borough Urban Sanitary District.**<sup>1</sup>—Area 2,517 acres, population (preliminary census, 1891) 4,351. During the year ending December 31st, 1891, the birth-rate was 25·5, and the death-rate 14·2 per thousand.

To phthisis seven deaths were due; eight were referred to diseases of the lungs, five to heart disease, two to injuries, one to rheumatic fever, and the remaining thirty-nine to old age and to various other constitutional causes, but none to zymotic diseases.

Twelve persons died under one year of age, twenty-three between one and sixty, and twenty-seven at upwards of sixty years of age. The infant mortality equalled 11·0 per cent. of the number of children born during the year.

<sup>1</sup> From Dr. M. K. Robinson's *Report to the Sanitary Authorities of the East Kent Joint Committee for 1891*.

# THE MEDICINAL SPRINGS OF GREAT BRITAIN

## PART I

### INTRODUCTORY REMARKS ON THE MEDICINAL SPRINGS OF GREAT BRITAIN

By W. M. ORD, M.D., F.R.C.P.

WHEN the baths and inland watering-places of Great Britain are marshalled before us for inspection, their number appears but small as compared with the abundance of similar provisions of nature existing upon the continent of Europe. However, in their relatively small array, some resorts can be ranked as of first importance.

It could hardly be expected that, where there is such a comparative paucity of choice, we should find representatives of all the kinds of thermal and mineral waters which determine the existence of large resorts among the continental peoples. Whilst Great Britain possesses some excellent thermal waters, none of them contain any such powerful mineral constituents as are found at Carlsbad, Aix-la-Chapelle, or Wiesbaden; neither do we possess any springs of a strong chalybeate quality, such, for example, as those of Schwalbach, Spa, Pyrmont, and St. Moritz; nor alkaline sources such as those of Vichy and Contrexeville; neither have we any waters in which excess of carbon dioxide produces natural effervescence, as at Homburg and other places.

There are, however, included in our list, sulphur springs of marked strength, besides saline springs and natural brines of no mean value, in several cases associated with the presence of iron, never in very large proportion, but often of much importance in the application of the varied resources of particular bath places.



Whilst it is thought desirable to include in our report all mineral waters in this country which are known to be used, for medicinal purposes, to any serious extent, it has been found necessary to deal in the present volume with only a limited number of springs of greater repute, together with a few others of less importance which rather occupy the position of satellites to one or other of these. The consideration of the remainder will be left for a subsequent volume.

On reference to the reports which follow, it will appear that the arrangement adopted is in the first place topographical, the English, Scotch, and Welsh spas being respectively grouped together. This method of classification has been rendered necessary by the diversity of the nature of the springs present together in some places, such as Harrogate, Strathpeffer, and Llandrindod, each of which spas would fall under several distinct headings in a strictly natural classification. Nevertheless, in each of the topographical divisions kindred springs have been, as far as possible, grouped together.

Bearing in mind such preliminary considerations, we may next point out that our British spas may be for the most part classified under three heads—viz., thermal, sulphurous, and saline.

Of the thermal waters, those of Bath and Buxton are of the first importance, whilst those of Matlock are only approximately thermal. Of the sulphurous spas, Harrogate takes the first place; Strathpeffer and Llandrindod have, each in its way, a considerable importance, whilst Askern and some other minor spas are also locally regarded as having special value.

Among the saline waters, those of Droitwich and Nantwich are now widely known, as supplying a strong natural brine; Saltburn and Stafford, with a similar supply, have at present attained to less note. Under this head we must also include certain waters containing smaller quantities of saline matter, such as those of Leamington, Cheltenham, and of Ashby-de-la-Zouch; those of Woodhall Spa, which appear to possess distinctive saline qualities, and those of Llangammarch, which are remarkable for the probably important presence of chloride of barium.

As regards places of special resort at the present day, our island contains no chalybeate spa of the first rank; but it cannot be

forgotten that Tunbridge Wells had formerly a great reputation; and we shall find that watering-places chiefly noted for other reasons have in some instances chalybeate springs, often usefully adjuvant in treatment. We may quote as examples of such association of chalybeate and other springs, Harrogate and Llandrindod.

Alkaline waters are, as has been already mentioned, entirely wanting in this country.

Beyond the questions of the temperature and chemical constitution of waters, questions of climate, of relative elevation of site, and, to no small extent, of social arrangements also, go far to determine the usefulness of particular inland watering-places. We shall, moreover, have to consider the use of accessory treatments, by artificial modifications of the mineral waters, or by the addition of waters from other sources, as well as in the form of mechanical or electrical therapeutical methods.

It may here be convenient to make a few general remarks as to the influence of our climate and of our national habits upon the full usefulness of our baths. The comparatively small range of our temperature has at once its advantages and its drawbacks. Whereas, during the winter, the majority of continental spas are closed, ours are for the most part still accessible. Considering how large a proportion of the patients seeking baths are residents of the metropolis and large towns, it is a great gain that such invalids should be able to obtain the help of baths in the winter, and should have, at the same time, the advantage of a fair amount of sunshine, otherwise too often denied to them by the smoke-laden atmosphere of their homes. On the other hand, it is certain that, in summer time, we in England cannot obtain nearly as much warmth and sunshine as can be enjoyed in continental watering-places. To be able to live all the day in the open air; now, when the sun is moderate, to bask in its rays; now, when it is excessive, to find abundance of shady resting-places; to do all this readily and without fatigue of journeying is of the greatest solace and help to the invalid. It must be admitted that the occurrence of such opportunities is not abundant in this country, and it must be admitted also that in our bath places the resources of nature are not on the whole sufficiently utilised. Moreover, we must not forget the importance and value of com-



fort and wholesome amusement. On the Continent, we find Kursaals or Casinos planted in the most agreeable sites, surrounded with gardens, and containing many forms of healthy recreation, music of fine quality in particular; whereas it is rather the exception to find, at home, well-placed and well-equipped pump-rooms; gardens, although often accessible, rarely open directly from the bath house, and the frequenters of the baths are for the most part left to amuse themselves. Although in some places efforts have been made in the direction of supplying these various needs, we must confess that our use of these more than incidental advantages falls short of what obtains abroad. It certainly appears to us to be highly necessary that our attention should be seriously directed to the development of such attractions, of out-of-door comfort, and of all that may distract sick people from the sense of their suffering.

There also arises here a question of some delicacy—namely, that of discipline and regimen. In the taking of baths and waters more has to be regarded than their simple influence, and there can be no doubt that the institution of strict discipline, in respect of hours of rising and of resting, in respect of exercise and of dietary, contributes very largely to the beneficial effects of a course. To this end the co-operation of the medical man and of his patient is necessary. Very probably our insular freedom is chargeable with some neglect in this matter. There is perhaps too little general concert of opinion and action among the medical men in our bath places, and still more a reluctance on the part of the patients to submit in England to a degree of restraint which they would readily accept at Carlsbad or Vichy.

We pass on now to the estimation of the therapeutic value of the several important spas of Great Britain.

Bath claims our first attention by reason of its antique renown, and by reason of the high temperature and abundant flow of its springs. We find here unlimited possibilities of applying naturally heated water to the surface of the body or of its parts. So far as baths are concerned this thermal aspect seems to us to present the real efficacy of the waters. For their chemical constituents are neither by their nature nor quantity such as might be expected to exert a decided medicinal action. We may remark in passing that both nitrogen and carbon dioxide are present in solution in

the waters. The presence of nitrogen in particular has been claimed by some authorities as contributing to their healing qualities.

For the complete and thorough application of a hot water, with no pronounced chemical constituents, Bath has at the present time an armament which, so far as our experience goes, is not excelled, if, indeed, it be equalled, by what exists in any similar resort in Great Britain or elsewhere. Every variety of bath, general, local, or combined, douche, vapour, spray, and gaseous, is provided in capacious chambers with fittings of luxurious completeness, and with ample provision of attendance.

In spite of their poverty in mineral constituents the waters have long been taken internally, partly on account of the small quantity of iron contained in them, partly for purgative and diuretic purposes. At present this application of the waters is not seriously made, but with due organisation it is probable that the old system might be revived with advantage in appropriate cases.

Buxton, as regards the thermal quality of its waters, cannot be directly compared with Bath. Whereas in Bath the temperature of the waters exceeds considerably that of the human body, in Buxton the average temperature is 82° F., decidedly less than the blood temperature. On first view, therefore, the waters might be expected, when applied externally, to exercise a mild sedative influence, opposing febrile excitement, and reducing inflammatory processes in joints. It appears that, in many cases of chronic inflammatory affections of joints, the well recognised tendency to neuralgic pains therewith associated becomes, in the earlier stages of treatment, almost acute. Many patients have to undergo in the first day of the cure an aggravation of their sufferings; but in the long run a marked relief of all the misery belonging to the neuralgic, as well as to the joint, affections is obtained.

In all probability the climate of Buxton operates in the way of helping the effects of the baths, particularly in obviating what might be an excessive effect of their sedative quality. The place stands high in a region of brisk air, by all accounts decidedly tonic.

The waters are poor in mineral ingredients, and have no special chemical qualities, unless the large proportion of nitrogen which they contain, and which can be seen rising in large bubbles to the surface of the baths, may be held to have a particular value.



The proportional quantity of this gas is larger than at Bath, so that the question of its therapeutic value is here increased. The bath appliances at Buxton are extensive and well organised. It has been found necessary to increase the heat of the waters by artificial means in the treatment of certain cases. The beauty of the public gardens in Buxton and of the surrounding country doubtless contributes to the beneficial uses of the place.

In the group of sulphur and saline waters Harrogate must be first regarded. Its natural advantages of site appear to make it, independently of its waters, a valuable health resort. With an elevation of 250-600 feet above the level of the sea, it appears to present a fairly equal balance between the winds of the east and west coast of its latitude, and from the nature of its soil and the absence of forest and superficial water to have an eminently dry atmosphere, a quality of great importance in the cure of catarrhal diseases. With this it possesses a wealth of springs hardly to be equalled. The number is at least eighty, and their varieties of constitution almost as numerous. They include pure sulphur waters, saline sulphur waters, pure chalybeate, saline chalybeate, and sulphated chalybeate waters. These are severally used, with careful isolation of each, in the treatment of a wide variety of diseases, and the arrangements for their application are exceedingly well organised.

Harrogate, with this great variety of springs, represents the resources of more than one continental place of repute. It has its Kissingen; it has its Auvergne springs; and it has a chloride of iron well of special and wide repute. The scenery in and around Harrogate is very attractive. Considering that in addition to such natural advantages the place offers much social diversion, and many interesting excursions, we are justified in speaking of it as taking a position of the first rank among bath resorts in this, or indeed in any country.

Strathpeffer in Scotland, and Llandrindod in Wales, resemble Harrogate in the character of their waters, but with less extensive variety. Strathpeffer, although situated in the north of Scotland, is dry and warm, being sheltered by hills on all sides, and is distinctly restful for invalids. It possesses an excellent establishment of baths in connection with the sulphur waters, which, in their application, are heated sometimes by the

addition of warmed pure rain water. Peat-baths (moorbäder), such as have been for many years in use on the Continent, first, we believe, at Franzensbad, and afterwards at Carlsbad, and other places where the natural supply exists, have in a corresponding way found application at Strathpeffer. Considering the recognised value of such baths, it is important to record that there is offered in this country the opportunity of obtaining them close to their source.

Llandrindod, again a sheltered place, possesses saline, sulphurous, and chalybeate waters. These are taken both internally and externally. They appear to be powerful in their action, and, like those of Strathpeffer, are likely to obtain a well-justified repute.

Of our brine baths, Droitwich, in Worcestershire, must be taken first. A salt spring of remarkable concentration has for years formed the source of a valuable industry, and at the same time has been used medicinally. For medical purposes the water is not used in the condition in which it emerges from the springs. It requires, in the first place, dilution by fresh spring water, usually in equal parts, and is also artificially heated, a temperature of from 90°-100° F. being found desirable. The baths are exceedingly well equipped, and are in part so placed that patients after bathing are able to return to their hotels without exposure to the outer air. It may be incidentally remarked that, generally speaking, such an arrangement is of great importance, and is especially important in our climate, when patients, after immersion in a heated and strongly mineralised water, have to seek a subsequent period of rest and gradual cooling.

In many places on the Continent brines obtained by evaporation of the natural waters are similarly used. We may quote Kissingen as illustrating this point. There partly by means of aerial evaporation, partly by the use of heat, a very considerable concentration of the ordinary waters is obtained, and the resulting liquor (soole) is used in baths attached to the Kurhaus, which is reached without exposure.

Nantwich, with a brine of about half the strength, which is therefore used without dilution, offers similar advantages on a smaller scale.

Among spas of weaker saline impregnation, Leamington may be cited as an example. The chief mineral ingredients of the



waters are chloride of sodium and sulphate of calcium ; and they are slightly alkaline. They are partly used internally, and for bathing purposes are heated to 99°-100° F. Leamington is much frequented by persons who have lived much in tropical climates, and appears to be chosen by them as a favourite residence. It follows, probably, from this circumstance that the town possesses social attractions, and beautiful public gardens, probably not equalled in our other bath resorts.

Cheltenham, in the same class, possesses waters of the magnesia-saline group, approaching in their constitution those of Marienbad. Like Leamington, Cheltenham is a prosperous town, also frequented by Anglo-Indians, and favoured by the presence of two large public schools.

Another saline spa, Woodhall, in Lincolnshire, has a special reputation in respect of the presence of iodides and bromides in its waters. Earlier analyses declared the presence of free iodine and bromine in these waters ; but these were not found by Prof. Frankland in an investigation recently made for the information of this committee. Our experience shows that the use of this bath is very effective in the treatment of various diseases.

Tunbridge Wells, claiming at one time a very considerable importance in respect of its chalybeate waters, cannot pass without remark. It is true that the use of the waters is but little maintained, but it is also true that as an inland health resort Tunbridge Wells exercises a powerful restorative influence on the jaded Londoner, and on children brought up in large cities.

In this introduction we have rather sought to set forth the nature of the several medicinal springs ; the installations provided for their application ; the local climates, and the various social advantages ; than to express opinions as to particular therapeutical uses. These latter are carefully considered in the reports which follow.

## BATH.

By W. M. ORD, M.D., F.R.C.P., AND A. E. GARROD, M.D., F.R.C.P.

BATH stands alone in Great Britain as a city of considerable size and much reputation, the beginnings of which have been determined by the existence of thermal springs. Tradition asserts that the first discovery of the springs and acquaintance with their healing virtues was made in primitive times, before the advent of the Romans. History records that within 100 years after the Roman occupation of Britain—that is to say, some eighteen hundred years ago—Bath was a place of much importance. Existing structures, in the shape of well-preserved remains of Roman architecture, testify both to the numbers and to the luxury of the frequenters of the springs, and to the relative largeness of the population of what appears to have been a fortified town with spacious forum and stately temples. Bath was probably the second town in rank in Britain during this period, the capital of ease and enjoyment, second only to the capital of commerce and arms. The brilliance of this epoch underwent sudden eclipse under the final departure of the legions about A.D. 410. For several centuries the fortunes of Bath were not related in any obvious way with its waters, though in later Saxon and in Norman times it retained and even increased its position as a great city of the west of England, in respect of both civil and episcopal power and dignity. With the Reformation came the beginning of a steady and long-continued decline, which reached its depth at the end of the seventeenth century. In the course of the first years of the eighteenth century something like a renewal of the early glory occurred. The spas of the Continent were closed to



Englishmen by the wars then proceeding. The ability of Beau Nash and his associates developed the natural resources of the place; and the fashionable world of the reign of Anne poured into the city, to bathe, to drink the waters, to indulge in all kind of gaiety, and, by building large houses with the excellent stone of the district, to give to Bath a certain architectural distinction which has been ever since maintained. The foundation of such prosperity was clearly not sound, so that in the earlier years of the present century Bath, although growing as a place of local importance, and possessing buildings, public and private, of imposing construction, had lost for the time its reputation as a centre of attraction for the gay or for the sick. Of late years the value of its waters has been once more a matter of great interest for the medical profession, and it has attracted an increasing number of invalids, for whose use a very large increase in the bath appliances has been gradually provided. This afflux promises for Bath a third epoch of attractive reputation.

**Geological Formation.**—But little can be stated, for the information of the Committee, that can be held to bear on the origin of the hot springs. In and around Bath a long series of strata, from the Carboniferous Limestone to the Upper Oolite, are exposed in various places. The hot outflow does not appear to proceed from any of these formations, but to penetrate upward from underlying palæozoic rocks, through the New Red Sandstone and the Lias, and thence through comparatively recent overlying deposits collected in the lower part of the basin. That basin may be said to be in a way hewn out of an elevated plateau, and traversed by the river Avon, which in many curves runs from east to west. The hot springs lie to the north of the river, considerably above its level, and around them the older part of the city is crowded and compressed. The plateau is mainly capped with oolitic formations, through which many percolations occur, giving rise to springs breaking out at various points on the slopes of the basin. These have in themselves no warmth. It must be supposed that some of them find their way through clefts in the lower strata to the palæozoic beds to return by other channels to the surface, heated always to the same degree, and always in uniform volume.

**Meteorology.**—The following meteorological data are based

upon the observations made at the Station at Bath, established in 1864, under the direction of the Rev. L. Blomfield, during a period of twenty years (1866—1885 inclusive) and are taken from the *British Association Handbook to Bath* (1888).

The mean temperature of the whole period was 50°·5 F.

SEASONS.	Mean.	Highest.	Lowest.	Range.
Spring ... ..	48°·4	51°·2	45°·8	5°·4
Summer ... ..	60°·3	63°·5	58°·1	5°·4
Autumn ... ..	50°·7	52°·3	48°·5	3°·8
Winter ... ..	41°·4	46°·3	36°·4	9°·9

Thirteen out of the twenty winters had a mean temperature above 40°.

The mean annual rainfall was 32·064 inches. The maximum was 42·294 inches, in 1882. Autumn is the wettest and spring the driest season. January, September, and October are the wettest months.

**The Thermal Waters.**—The Bath mineral waters are derived from three springs, all having high but differing temperatures—namely, the Hot Bath of 120° Fahrenheit, the King's Bath of 117°, and the Cross Bath of 104°. To these is added by some authorities as a distinct source the Kingston Bath of 108°. No other springs in Great Britain approach these in the matter of heat, the Buxton waters taking the second place with 82° Fahrenheit.

The waters of the several springs are alike in their chemical constitution, and the nature of the mineral ingredients is shown in the following analyses of the water of the King's Bath.

I. By Mr. GATEHOUSE, City Analyst.

	Grains per imp. gall.
Lime ... ..	44·240
Sodium ... ..	13·500
Potassium ... ..	3·100
Ammonia ... ..	0·195
Ferric oxide ... ..	0·860
Magnesia ... ..	6·500
Sulphuric acid ... ..	71·483
Chlorine ... ..	20·581
Nitric acid ... ..	1·082
Carbonic acid ... ..	4·205
Silica... ..	2·800
	<hr/>
	168·546

Traces of arsenic, calculated as arsenious acid, probably as arsenite of iron =  $\frac{1}{100}$  gr. per imp. gall.

II. By Mr. CHARLES EKIN, F.C.S., F.I.C.<sup>1</sup>

	Grains per imp. gall.
Calcium ... ..	28·1449
Magnesium ... ..	3·6569
Iron ... ..	0·8400
Potassium... ..	2·1540
Sodium ... ..	9·4200
Silica... ..	2·5012
Sulphuric acid ... ..	74·2915
Chlorine ... ..	19·3900
Carbonic acid combined...	6·1600
Ammonia ... ..	0·0175
Nitrogen as nitrates ...	0·0035
Arsenic ... ..	Traces
Aluminium ... ..	Traces
Lithium ... ..	Traces
Strontium ... ..	Traces
Total solids ... ..	165·2000

<sup>1</sup> From *The Thermal Baths of Bath*, by H. W. Freeman, F.R.C.S.I. 1888.



In an analysis by Mr. Attfield the elements are combined as follows —

	Grains per imp. gall.
Calcium carbonate ... ..	7·84
Calcium sulphate ... ..	94·11
Calcium nitrate ... ..	·56
Magnesium carbonate ... ..	·56
Magnesium chloride ... ..	15·24
Sodium chloride ... ..	15·19
Sodium sulphate ... ..	23·16
Potassium sulphate ... ..	6·70
Ammonium nitrate ... ..	1·06
Ferrous carbonate ... ..	1·22
Silica ... ..	2·71
	<hr/> 168·35
Traces of rubidium, lithium and strontium.	
	Dissolved gas per imp. pint.
Oxygen ... ..	0·74
Nitrogen ... ..	4·60

Thermal waters presenting such small mineral ingredients are commonly called "simple thermal waters." The large quantity of nitrogen present is however regarded by some authorities as an important element in the efficacy of the baths. At present no methods are used to store, or to prevent the escape of this gas before its influence can be exerted during the process of bathing.

The application of the thermal waters to the treatment of disease is carried on at several separate establishments, which may be briefly mentioned as follows:—

(1) The King's and Queen's Public and Private Baths, adjoining the Grand Pump Room.

The large King's Bath is open to the sky. This is the oldest part of the more modern baths. Adjoining it is the Roman Bath.

Here are vapour, reclining baths, &c. Adjoining this establishment is the new wing opened in 1889 in which the Aix-les-Bains system is carried out.

(2) The Royal Private and Hot Baths. Here the hot bath is an open bath like the King's Bath. It holds 7,570 gallons, and is four and a half feet deep. There are also private reclining and immersion baths, douches, &c., as well as a tepid swimming bath.

(3) The New Royal Private and Swimming Baths, attached to

the Grand Pump Room Hotel. Here are reclining and douche baths, each containing 150 gallons; also needle douches, and a large swimming bath.

(4) The Cross Bath, a cheap public bath. The temperature of this bath is 96°—98° F. The spring which supplies it has a temperature of 104°.

The above establishments now belong to the Corporation of Bath.

They are supplied by the three springs as follows :—

One spring supplies the fountain in the Grand Pump Room, the King's Public and Private Baths, the large tepid swimming bath, and the New Royal Private Baths adjoining the Pump Room Hotel; and the baths of the Mineral Water Hospital.

A second spring supplies the Cross Bath; and a third the Hetling Pump Room, the Royal Baths, and a bath in the Royal United Hospital.

**Modes of Use of the Waters.**—(1) Internal. A continual flow of the mineral water, coming straight from the spring, is supplied by a fountain in the Grand Pump Room. The temperature of the water is 114° Fahrenheit; the supply copious and constant. It appears that when this water is cooled the iron which it contains is precipitated. The water is therefore taken at higher and lower temperatures by different frequenters of the Room. Formerly the internal treatment was much in vogue, and large quantities of the hot water were ordered, or taken without orders. At present the amount usually drunk is from four ounces to half a pint twice a day.

(2) External. The establishment of baths is extensive, well arranged, and comprehensive. In structure, in the excellence and elegance of fittings and appliances, in orderly and efficient service, they take a very high place among European provisions of the kind. In fact, it is difficult to conceive a better general installation.

The modes of bathing are various. Originally the general method appears to have consisted in immersion in deep cisterns so that the patient standing would be covered to the neck. So covered, he would be encouraged to move about in order to promote flexibility of joints. Baths fitted for this purpose are to be seen in the Mineral Water Hospital, capable of holding



several patients at once. The King's Bath was used in this way. And large single baths, some of them sumptuously fitted, are provided in the wing adjoining the Grand Pump Room Hotel and in the establishment connected with the Grand Pump Room. The temperature of these baths is from 98° to 104° Fahr., according to the nature of the cases and the practice of the physician in charge. Combined with this immersion a wet or underwater douche is often used, water of a higher temperature than that of the bath issuing from a large hose with much force, so that the current may be directed upon particular parts of the surface of the body or limbs at various distances, according to the nature of the case and the susceptibility of the patient. When cooler baths are used the diminution of temperature is effected by the addition of stored, and therefore cold, mineral waters.

A second series of baths are arranged for patients assuming a reclined instead of an erect posture. In connection with some of these an apparatus is provided by which patients, placed upon a suitable couch, can be lowered into the water without any exertion on their part. The temperatures are much the same, and the submerged douche is in frequent use.

In connection, or perhaps in contrast, with these may be mentioned the so-called "dry douches." By this term is to be understood the application of columns of the mineral water at temperatures of 100° to 105°, in smaller or larger calibre and in various numbers, to the whole surface or to parts of the body; these include needle douche at 100°, ascending douche, rose douche, and spinal douche.

A notable modification of this class of douches has been adopted, in imitation of a system prevailing at Aix-les-Bains. Here two attendants direct upon the surface of the body and limbs a copious douche of the mineral water at 96° to 100° Fahr., employing at the same time massage. The operation occupies ten to fifteen minutes. Various sprays and showers are often used in addition. Comfortable cooling-rooms are appended to this part of the establishment.

A considerable variety of appliances for special parts is also provided, such as the Scottish douche for hysterical cases, sitz baths for pelvic troubles, douches for the same, and sprays and pulverizations for nasal and faucial treatment.

Provision is also made for the administration of Berthollet local

vapour baths. The vapour from the head of the spring is applied by carefully devised casings to such parts of the body as may be required to be treated. This proceeding is usually lengthy, occupying from thirty to forty minutes.

A general natural vapour bath, in which patients sit or stand in a steam of the emanations from the hot waters is provided; reminding one of what may be seen in the bath-places of Auvergne.

One room deserves special mention, the umbrella spray chamber, wherein strong but thin streams of hot mineral water play upon a metallic dome, and are pulverized. The room, which is beautifully appointed, becomes filled with something like a Scotch mist, and is intended to be used by patients suffering from chronic catarrh of the respiratory passages.

Lastly it must be mentioned that swimming baths of various temperature and cost form a part of the equipment. The best of these are provided with cold douches accessible to the bathers.

**Season of the Year.**—Bath being sheltered by its surrounding hills affords an excellent winter residence, and the course may be entered upon at any season of the year. Spring and autumn are indeed the periods of greatest activity. Among the local physicians there is a preponderance of opinion in favour of April, May, September and October as the best months of all, but it is only during December, January, July and August that there are comparatively few patients under treatment.

All arrangements are made to ensure the comfort and meet the requirements of those who undergo the treatment during the cooler months, which by long-established custom have come to be looked upon as the Bath season *par excellence*.

The duration of the course varies according to the nature of the case, usually lasting from three to eight weeks.

### **Therapeutical Uses of the Waters.**

The following summary of the therapeutic effects of the Bath treatment, both by the internal use of the waters, and by their external application, is based upon the replies to our circular letter, received from a number of the medical men residing in



Bath, who have been good enough to supply us with much valuable information upon this question.

Our thanks are specially due to Drs. Brabazon, Goodridge, Douglas Kerr, and Kent Spender, and to Messrs. Craddock, Freeman, Lane, Pagan Lowe, Ransford, and C. Terry.

**General Action of the Waters.**—When taken internally the Bath water has a distinctly diuretic influence, and, when taken in such large quantities as were formerly prescribed, it even acts as a purgative. These effects may be in part due to the mere action of the hot water, apart from its mineral ingredients, for the therapeutic action of hot water has attracted much attention of recent years. It is claimed for the water that when drunk, and also when externally applied, it stimulates the excretion of effete products, and especially of urea and uric acid, by the kidneys. To this action are ascribed the benefits derived from the Bath treatment in gouty cases; and there are those who claim for the treatment a specific action in rheumatism as well as in gout. It seems probable that in many instances the chief factor in the cure is the unlimited supply of hot water, which may be applied at any bearable temperature, and in any manner—that is to say, by immersion, or by douches, or in the form of spray or vapour.

The minute quantity of iron and of arsenic which is contained in the water may be of service in some cases, and it is interesting to note that the deposition of the iron, which takes place when the water is allowed to cool to the ordinary temperature of the air, renders it possible to administer the water internally, in cases in which even such small doses of iron are considered to be contra-indicated.

We take it that the idea that telluric heat has in itself any peculiar therapeutic value, and that water rendered hot by nature is in any different physical state from the same water artificially heated, cannot be now entertained.

Special virtue is claimed for the Bath treatment in diseases which involve the articular structures, and the sufferers from such diseases constitute a very large proportion of the patients who seek relief at Bath.

**In Gout and Gouty Affections.**—Especially successful appears to be the treatment of gout both in its articular manifestations

and in the various visceral troubles which are likewise dependent upon the gouty diathesis.

Some even venture to treat acute and subacute articular gout by means of the Berthollet vapour baths, but any such acute or subacute trouble is held to be an absolute contra-indication to the employment of the immersion bath.

It is in the so-called "larval" or "incomplete" gouty conditions, and during the intervals between the attacks, that the Bath course appears to be especially valuable.

**In Osteo-Arthritis.**—There are considerable differences of opinion among the local physicians as to the value of the treatment in osteo-arthritis. Whereas some maintain that both the internal and external uses of the waters are of singular value, especially in the early stages, others hold that this is chiefly the case when this disease follows as a sequela of true rheumatism, whilst in cases of a neurotic type the course is of no more value than other forms of treatment, if indeed it should not be regarded as contra-indicate. Possibly these conflicting views may be in part due to the unsuitability of immersion baths for many of the sufferers from this disease, who, nevertheless, often derive considerable benefit from the douche-massage treatment.

**In Rheumatism.**—The Bath treatment is especially efficacious in removing the residual articular pains which not infrequently persist after recovery from an attack of acute rheumatism. Such pains, and the stiffness which accompanies them, yield quickly to the use of hot baths, douches, and massage.

The Berthollet vapour baths are sometimes employed in subacute cases, but it is usually held that the proper time for the treatment is only reached when all active articular mischief is at an end. The treatment is especially effectual in the cases of children and young adults.

It is maintained by some that the waters taken internally have a specific effect in rheumatic cases.

Other rheumatic affections besides articular pains are treated with success, and much value is claimed for the course in the treatment of endocardial lesions, provided that the patients resort to Bath shortly after the acute attack in which the heart disease had its origin. On the other hand, the treatment is absolutely contra-indicated if the compensation is deficient, and the



mechanical effects of the disordered circulation are present; as well as in cases of heart disease which have their origin in degenerative rather than in inflammatory changes.

In chorea also, and especially in rheumatic chorea, the treatment is said to be beneficial; a modified course of douche-massage being sometimes employed in such cases.

**In Muscular Rheumatism.**—The muscular affections which are grouped together under the vague name of muscular rheumatism are among those in which the benefit derived from the Bath treatment is most striking.

**In Gonorrhœal Arthritis.**—As might be expected, the results appear to be less conclusive in cases of gonorrhœal rheumatism. The local vapour bath is employed by some in the earlier stages of this disease, and the immersion bath in the more chronic stages.

**In Sciatica.**—Sciatica is found to be greatly relieved by douche-massage, as well as by the immersion baths, an undercurrent douche being directed upon the painful part. The more acute stage of the complaint appears to be better treated by the simple immersion bath.

**In Syphilis.**—Bath lays no special claim to value in the treatment of syphilitic conditions, but the course is sometimes taken as an adjunct to specific treatment.

**In Anæmia.**—Since the Bath water contains small quantities of iron and of arsenic it is recommended by some for the treatment of anæmia, especially when of malarial or gouty origin. The climate of Bath is however held by some to be unfavourable to anæmic patients.

**In Eczema.**—Eczema, in its acute stage, is treated by the natural vapour baths, in its chronic stages by prolonged immersion. Some recommend the treatment for the dry forms only, whilst others maintain that moist skin diseases are even aggravated by the thermal baths.

**In Psoriasis.**—It is agreed that psoriasis yields more or less to the course, either alone, or in conjunction with other forms of treatment.

Amongst other skin diseases, which are occasionally treated with success, are the various forms of lichen, senile prurigo, and ichthyosis

**In Diabetes.**—Little is known of the action of Bath water in diabetes and glycosuria, but good results are claimed by some for the internal use of the water, cold, the process of cooling leading to the precipitation of the contained iron.

**In Diseases of the Respiratory System.**—The water is used in a pulverized form for chronic bronchitis, laryngitis, and pharyngitis, but it is commonly held that the treatment is most successful in respiratory affections dependent upon the gouty habit.

**In Diseases of the Digestive System.**—The same may be said of the use of the water for affections of the digestive system, but the treatment is also employed in cases of chronic gastritis, biliary colic, &c.

**In Diseases of the Nervous System.**—The successful treatment of chorea has already been mentioned. The chronic stages of paralytic conditions are treated with some success by immersion, douching, and massage. Bath has long enjoyed great repute for the treatment of lead poisoning. In spinal sclerosis the benefit is less obvious, and is altogether questioned by some. Multiple neuritis and anterior poliomyelitis may also be mentioned among the conditions treated.

**In Diseases of Women.**—Opinions vary as to the utility of the Bath treatment for the diseases of women, but among the conditions which are said by some to be treated with considerable success are cases of leucorrhœa, cervical catarrh and induration, sterility and interrupted or painful menstruation, as well as ovarian neuralgia.

**In Results of Injury,** especially to joints, with stiffness and pain, patients are treated by douches and massage with good results.

Moreover the course is said to be useful in convalescence from acute diseases, and in removing the effects of malarial poisoning.

**Contra-indications.**—All acute diseases with high temperature; pulmonary affections; tubercular joint disease; heart disease in any but the earliest stages, and irritable heart, are regarded as contra-indications to the Bath treatment. Patients with a tendency to insanity should also avoid this treatment, as well as those who suffer from nervous exhaustion in connection



with osteo-arthritis, and those who have a history of apoplectic seizures or hæmorrhages.

**Summary.**—It is evident that the internal use of the Bath waters has a certain value. Taken, as they were in former times, in large quantities they have a strong purgative effect. Their mineral constitution cannot be supposed to have much, if any, influence of the kind. And we are inclined to refer the action to the ingestion of a large bulk of hot fluid. Taken, as at present, in very moderate doses, at a temperature of about  $110^{\circ}$ , they appear to have a diuretic action favourable to the elimination of uric acid. Satisfactory evidence of such elimination is much needed. The chalybeate impregnation of the waters may be well supposed to be useful in the treatment of anæmia; but the proportion of iron is relatively small, and for effective treatment a larger quantity than is usually prescribed seems necessary for this purpose. The value of the administration of the water, cooled and deprived of its iron, in the treatment of diabetes is not easy to understand, but must certainly be borne in mind.

In considering the operation of the baths the first point is one to which reference has already been made, namely, the provision by nature of an extraordinary and practically inexhaustible flow of water so hot as to be applicable, by due management, at all temperatures that can be borne. The due adjustment of temperature to the needs of various cases is surely a question of the greatest delicacy and judgment, constituting in our opinion the most important part of the treatment in regard to many diseases. The saline constituents can hardly be held to be of importance in this aspect. They make the water somewhat a hard one, and so far they tend to oppose the influence of hot immersion where action of the skin is to be promoted. A hardness and dryness of the skin following the use of the baths is often a subject of complaint among the patients. Whether the gaseous constituents deserve regard is not to be decided at once. That nitrogen is held dissolved in large actual and relative quantities—relative, that is to say, to the proportion of oxygen—is a statement frequently made and much importance has been attached to this nitrogenous implication. A paper recently published by Sir George Johnson shows that nitrogen, inhaled, acts as an anæsthetic after the manner of nitrous oxide. Is it possible that nitrogen dissolved in water,

and free from the opposition of oxygen, may exert a sedative action on the surface of the body? Or is there, after all, something in this alleged "telluric heat" conferring on nitrogen, issuing in the thermal waters, some new qualities, dependent on some allotropic change, which give a special virtue to the baths?

Reviewing the numerous appliances provided, it is obvious that the armament is very complete and many sided. No one can doubt that gout, anæmia, neuralgia, and many diseases of the skin can here find powerful methods of relief. And with the increase of resource and the recognition of the influence of high as well as of moderate temperatures; of the influence of different temperatures applied generally and locally at the same time; of the association of massage with profuse douching; it may well be hoped that many diseases, not hitherto considered to be suitable for treatment at Bath may be brought under its remedial power. These remarks may be illustrated by the position of chronic osteo-arthritis, considered generally to be rather injuriously than beneficially affected by the Bath waters. It appears to us that under the application of decidedly hot temperatures in association with massage, and the hot spinal douche, many cases of this kind may be greatly helped.



## BUXTON.

By W. M. ORD, M.D., F.R.C.P., AND A. E. GARROD, M.D., F.R.C.P.

THERE is some reason to believe that the thermal springs of Buxton were known and employed for bathing purposes at as early a period as that of the Roman occupation of Britain, although no extensive remains of Roman baths, such as form a characteristic archæological feature at Bath, have been discovered. The real history of Buxton, as a prosperous spa, commences with the Elizabethan era, when it was more than once visited by the ill-fated Mary Queen of Scots, and by other leading personages of that brilliant epoch.

Bath and Buxton stand alone among British bath places in the possession of waters to which the term "thermal" can be strictly applied, for the springs of Matlock, which stand next in order of temperature, only attain to 68° Fahrenheit. If Buxton has never attained to the excessive popularity and fashion which Bath has enjoyed at certain periods of its history, its prosperity has been more steadily maintained, and has never suffered any noteworthy eclipse.

Moreover, whilst its thermal springs must always give to Buxton a place in the front rank of British inland health resorts, its attractions are materially increased by its bracing climate, which renders it pre-eminently a summer resort, whereas the season of greatest activity at Bath is in the winter months.

Thus our two thermal spas supplement each other, and afford opportunities for the treatment of cases in which such waters prove beneficial, at all seasons of the year.

Situated among the high lands of the Peak district of Derbyshire, at an elevation of about 1,000 feet above the sea-level, the

town of Buxton lies in a deep valley and is surrounded by bold and picturesque hill and moorland scenery. This valley is approached by a ravine through which the river Wye flows downward to its junction with the Derwent. The town is built upon the junction of the mountain limestone and the millstone grit, the limestone lying to the north, east, and south, the gritstone to the west.

It is around the bottom of the valley, where the thermal springs rise through several orifices in the mountain limestone, that the activity of Buxton as a health resort centres. Here is situated the Crescent, a massive block of buildings, classical in style, erected by a past Duke of Devonshire in the year 1780, the projecting first floor, being supported by a colonnade, and affording a covered promenade in rainy weather. The Crescent itself is now occupied by two large hotels, and is flanked on one side by the "natural," and on the other by the hot baths.

Facing the Crescent, and separated from it by an open space, is the new Pump-room, opened in 1894, behind which rises a grassy slope traversed by gravel walks and topped by the new Town Hall and the houses of the upper town.

Standing upon this slope one has at one's feet the Pump-room and Crescent, behind which, on the slope of the opposite hill, are seen another large hotel, the Devonshire Hospital, and other buildings.

The Devonshire Mineral Water Hospital, which affords accommodation for 300 patients, is an extensive building originally constructed to provide stabling for the horses of visitors staying in the Crescent. The large circular central space has been covered in by an immense dome, said to be the largest in the world, and now forms a covered recreation ground for the patients. Large day-rooms are also provided for the patients, almost all of whom are able to leave their beds in the daytime. A separate pump-room and bathing establishment is devoted to their use.

The environs of Buxton afford numerous interesting drives and excursions, and the amusement of visitors is further provided for by the Buxton Gardens Company. The gardens, which lie to the west of, and rather behind the Crescent, are tastefully laid out, and include a very small boating lake, lawn-tennis court and a bowling green. The pavilion, corresponding to the Kurhaus or Casino of



a continental spa, contains a theatre capable of seating an audience of 800 persons, a concert hall and reading room.

The water supply of the town is obtained from springs in the millstone grit, issuing above the level of the houses, and the drainage is carried through earthenware pipes to a spot half a mile from the town, where it is dealt with by approved methods for its utilisation and destruction.

The following data, derived from the report of the meteorological station at the Devonshire Hospital, will serve to give an idea of the characters of the Buxton climate.

The mean maximum temperature for January, the coldest month, for a period of ten years was  $40.1^{\circ}$ , and the mean minimum was  $30.0^{\circ}$ . For July during the same period the mean maximum was  $65.1^{\circ}$ , and the mean minimum  $48.4^{\circ}$ . The highest temperature recorded in 1893 was  $83^{\circ}$  F. on August 18th, and the lowest was  $-0.4^{\circ}$  F. on January 5th.

The highest mean rainfall during the ten year period was in October and November, 5.23 and 5.70 inches respectively; the lowest in April, 2.48 inches. The yearly mean was 46.2 inches.

The highest mean number of hours of sunshine was in June (151 hours); the lowest in December (22 hours).

**The Thermal Waters** are tepid or warm rather than hot, having a uniform temperature of  $82^{\circ}$  F. The supply is abundant and is in part lost, running to waste into the river Wye. The well which supplies the "natural baths" is said to have an available output of  $129\frac{1}{2}$  gallons per minute, and there are other springs which supply the pump-room and hot baths.

The water is poor in mineral ingredients and may be classed with "simple thermal" waters. Its chief chemical peculiarity is the presence in solution of nitrogen gas in quantities exceeding those found in other waters of the kind, such as those of Wildbad and Gastein, which among continental waters most nearly resemble it. The chief physical features are its temperature and its striking and beautiful pure blue tint, which is independent of the manner of illumination, although more conspicuous in a favourable light.

The most recent analyses are those of Dr. Thresh, carried out during the years 1880, 1881, and 1882, which give the following constitution:—

	Grains per gallon.
Bicarbonate of calcium ... ..	14·01
„ magnesium ... ..	6·02
„ iron ... ..	·03
„ manganese ... ..	·03
Sulphate of barium ... ..	·05
„ calcium ... ..	·26
„ potassium ... ..	·62
„ sodium ... ..	·84
Nitrate of sodium ... ..	·03
Chloride of calcium ... ..	·02
„ sodium ... ..	3·10
„ ammonium ... ..	trace
„ magnesium ... ..	·95
Silicic acid ... ..	·95
Organic matter ... ..	·02
Carbon dioxide ... ..	·20
Nitrogen ... ..	·19
	<hr/>
	27·32

Lithium, strontium, lead, and phosphoric acid, traces.

A series of analyses of the gases evolved gave

	Cubic inches per gallon of water.
Nitrogen ... ..	6·1
Carbon dioxide ... ..	4·1
	<hr/>
	10·2

which gives the percentage composition :

Nitrogen ... ..	59·78
Carbon dioxide ... ..	40·22
	<hr/>
	100·00

There is, moreover, a chalybeate water which is supplied for drinking purposes in a special pump-room near the baths, and which is largely employed as an application to the eyes.

This water contains but little iron and is almost devoid of the characteristic inky taste of richer chalybeates. The following is an analysis made by Lord Playfair in 1852 :—

	Grains per gallon.
Ferrous carbonate ... ..	1·044
Calcium sulphate ... ..	2·483
Alumina ... ..	trace
Magnesium carbonate ... ..	0·303
Potassium sulphate ... ..	0·147
Sodium chloride ... ..	1·054
Potassium chloride ... ..	0·460
Silica ... ..	1·160
Magnesium sulphate ... ..	0·431
	<hr/>
	7·082

M M 2



**The Pump-Room.**—A new pump-room for the supply of the thermal water for drinking purposes was opened in 1894 by the Duke of Devonshire, who is the proprietor of the mineral springs. This new building is situated at the foot of the grassy slopes which face the Crescent and baths. The water, although tasteless, is not very agreeable to drink on account of its tepidity. It becomes somewhat cooled in its passage from the spring to the pump-room.

**Baths.**—Two systems are in use for the outward employment of the waters, and are carried out in separate establishments at the two ends of the crescent.

The "natural" baths, so called because in them the thermal water is used as it flows from the spring without any further heating, are situated at the west end of the crescent. These are all immersion baths, provided with arrangements for douching. There are first and second class plunge or swimming baths for men, and a similar bath for ladies as well as private baths.

The large first-class men's bath has a length of 30 feet, a breadth of 16 feet, and a depth of 4 feet 6 inches. The sides are faced with white porcelain-coated bricks, and the floor is of white marble perforated with holes through which the water enters constantly from the spring immediately beneath, and through which large bubbles of gas rise occasionally to the surface. It is here that the blue tint of the water is seen in the greatest perfection.

The private baths, also lined with glazed bricks and with marble floors, have a depth of 4 feet 6 inches, and being 10 feet long by 4 broad, allow of that amount of movement during immersion which is rendered desirable by the low temperature of the water.

The dressing rooms and other fittings of the "natural" baths are not altogether worthy of the place, and would admit of improvement.

The hot baths are situated at the eastern extremity of the Crescent, and in them the mineral water is employed artificially heated to any desired temperature from 86° to 100°.

The temperature is raised by mixing with the natural water a varying quantity of the same water which has been heated in a tank, by means of a steam coil, to about 200°.

Here the bathing arrangements are very complete, comprising immersion baths for both sexes, containing 240 gallons of water,

in which the patient sits with the water up to his chest. Each pair of baths is connected with three dressing rooms. One bath for each sex is supplied with a chair and crane for the lowering of crippled patients.

Douches of various kinds and shower and needle baths are provided, as well as vapour baths and steam douches.

The massage bath is a feature of this establishment, being a flat dish of copper coated with white metal, in which the patient reclines whilst treatment by sprays, douches, and massage is applied.

Behind the hot baths is a third bathing establishment and a pump-room for the exclusive use of the patients in the Devonshire Hospital. Here there are four well-appointed immersion baths for each sex, and also cripples' chairs and cranes.

**Modes of Employment of the Waters.**—As already mentioned, both the chalybeate and thermal waters are taken internally, the latter in doses of four ounces to half a pint.

The natural baths are preferred for patients who are able to take them, but for those who have not a satisfactory reaction after the bath, or for whom for any other reason the tepid bath is considered undesirable, the hot baths are prescribed.

The patient remains only a short time—from four to seven minutes—in the natural bath, and keeps in motion throughout, whereas in the hot baths the period of immersion varies with the temperature and other circumstances from three or four to fifteen minutes.

After the bath the patient is wrapped in hot towels and dried by means of gentle rubbing. If the patient is able to do so he should take a brisk walk after the natural bath, to ensure a proper reaction, and this may be followed by rest in the house.

**Season of Year.**—The summer months from April to September are those in which the course should if possible be taken, but the baths are open all the year round and the season is determined by the climate of Buxton, which in early spring is uncertain, and during the winter is too cold and bracing for any but robust persons. If the course is entered upon in the colder season precautions should be taken against chill, and adequate clothing for a cold climate should be provided.



For the information here epitomised as to the therapeutic actions of the Buxton waters we are indebted to the resident medical men who have returned answers to the questions propounded in our circular, and especially to Dr. Robertson, Dr. R. O. G. Bennet, Mr. Arthur Shipton, Dr. Lorimer, and Dr. Palmer.

**General Action of the Waters.**—The waters are described as stimulating, alterative, depurant, and diuretic, and as having a detergent effect upon the skin, improving its tone and function. Their use is said to be followed by an increased excretion of urea and uric acid. The stimulating effect is more quickly observed after drinking than after bathing in the waters. Persons in perfect health may experience after drinking a slight sense of giddiness and increased warmth, and if partaken of in excess the water is said to produce effects the reverse of stimulating.

At the commencement of the course the use of the baths and waters may be followed by some nervous disturbance, such as insomnia, palpitation or giddiness, and sometimes gives rise to increased aching and stiffness of joints or even slight febrile disturbance.

Healthy persons taking the natural baths are apt to experience a momentary shock followed quickly by a reaction; and if satisfactory reaction does not take place patients should be advised to take the hot baths instead. Under no circumstances should a limit of seven or eight minutes' immersion in the natural baths be exceeded.

Cases are narrated in which patients taking the natural baths injudiciously have experienced serious or even fatal results, but one of our informants states that with an experience of close upon 22,000 cases treated at Buxton he has only noted one instance in which death occurred apparently as the result of a bath. In this case the patient was attacked with apoplexy while in the bath, and died some days later.

The effects of the hot baths are in this respect said to be much less marked.

Dr. Robertson ascribes the major part of the efficacy of the Buxton water to the dissolved nitrogen which it contains.

**Therapeutical Uses of the Waters.**—**Gout** and gouty affections have a foremost place among those conditions in which

benefit is derived from the use of the Buxton waters both internally and externally.

This applies not only to the chronic and subacute articular manifestations of the disease, but also to the various non-articular lesions often classed together under the name of irregular gout. During acute attacks the baths are certainly contra-indicated, but the course may be taken with advantage in the intervals between articular attacks with a view to warding off the return of the disease.

**In Rheumatism.**—The residual pain and stiffness so often persisting after an attack of acute or subacute rheumatism is another condition in which very satisfactory results are obtained at Buxton; and the patient's troubles usually quickly subside under the treatment. In cases in which the heart has been involved in the course of the acute attack great care should be taken to avoid any ill effects, and serious valvular disease may be regarded as a contra-indication to the course.

**In Osteo-arthritis.**—In early cases some benefit may be derived from the treatment, but to obtain this effect the course may require to be repeated, or to be prolonged beyond the usual limits. In advanced cases the results are insignificant, and pronounced osteo-arthritis cannot be ranked among the conditions specially suitable for treatment at Buxton.

**Sciatica,** when of gouty or rheumatic origin, is decidedly amenable to the internal and external use of the waters. In the more acute cases the natural baths are not well borne, but the hot baths may be substituted.

**Muscular Rheumatism** when not in an active stage is said to be in some cases quickly relieved by the combined internal and external use of the waters.

**Gonorrhœal Rheumatism** and its effects upon the joints are among the conditions relieved by the external treatment. One of our informants has seen much benefit from the hot steam douche in such cases.

**In Tubercular and Scrofulous Affections.**—Any benefit derived by tubercular patients is to be attributed rather to the situation and air than to any effects of the waters.

**In Anæmia.**—The same is true of anæmia, but recovery may be aided by the administration of the chalybeate water, which is, however, by no means rich in iron.



**In Diseases of the Skin.**—Skin diseases of gouty origin, and especially gouty eczema, are said to be benefited by both the internal and external treatment.

**In Diabetes and Glycosuria.**—Only one informant mentions any effect of the course on these conditions, and he states that he has obtained good results from the internal use of the waters.

**In Urinary and Renal Diseases.**—Among urinary and renal disorders amenable to the treatment, oxaluria, uric acid calculus, and gouty cystitis are mentioned.

**In Diseases of the Digestive System.**—Some forms of acid dyspepsia and some cases of functional derangement of the liver are stated to be treated with benefit.

**In Diseases of the Nervous System.**—Among the nerve lesions mentioned as relieved are the neuralgia of herpes zoster and other forms of neuralgia, lead palsy, chorea, and the early stages of locomotor ataxia, as well as some functional disorders of the nervous system.

**In Diseases of Women.**—Ovarian neuralgia and amenorrhœa with debility are mentioned.

**In Results of Injuries.**—Improvement is obtained in cases of stiffness of joints or muscles after sprains and other injuries.

**Certain affections of the eyes,** such as conjunctivitis, scleritis, and in some cases of iritis, are also said to improve under treatment at Buxton.

**Contra-indications.**—The course is contra-indicated in the following conditions:—

1. Febrile disturbance.
2. Marked debility.
3. Plethora, or a tendency thereto.
4. Advanced lung disease.
5. Advanced valvular disease of the heart, feeble or fatty heart, or atheroma of vessels.
6. Advanced kidney disease.

The internal use of the waters should be discontinued if nausea or diarrhœa is caused.

## MATLOCK BATH.

By A. E. GARROD, M.D., F.R.C.P.

THE second in importance of the thermal waters of Derbyshire rises to the surface at Matlock Bath, one of four places to which the name of Matlock is given, and which extend for a considerable distance along the dale of the river Derwent; the other three being known respectively as Matlock Village, Bridge, and Bank.

The scenery of the narrow dale, flanked by lofty hills and cliffs of mountain limestone, here known as Tors, is very beautiful, and its charm is increased by an abundant foliage, whilst its sheltered position gives to Matlock a considerably milder climate than that of Buxton.

In addition to the thermal springs there are several springs which are possessed of petrifying properties; and among the features of the place are several caverns, some of which were formerly worked as lead mines, which penetrate for long distances into the limestone hills which overhang the town.

The thermal water has a constant temperature of 68° Fahrenheit, fourteen degrees lower than that of Buxton, which it somewhat resembles in its delicate blue colour when seen in bulk.

The mineral ingredients of the water are scanty, and their nature is shown in the following analysis made by Dr. Dupré, F.R.S.

	Grains per gallon.
Chloride of sodium ... ..	4.57
Sulphate of magnesium ... ..	9.73
Sulphate of calcium ... ..	2.04
Carbonate of calcium ... ..	14.68
Silica ... ..	0.71
	<hr/>
	31.73
Organic matter, traces of alumina, potassium, lithium and stronthium; and loss ... ..	1.03
Total dry residue as found by direct estimation ... ..	32.76



The water contains a small amount of free carbon-dioxide.

The thermal water is supplied for drinking purposes and for baths at the Fountain Baths, a private establishment on the main street. Here there is a swimming bath 50 feet  $\times$  22 feet, supplied by a spring which has a daily average flow through the bath of 600,000 gallons. The temperature of the bath is the natural temperature of the thermal water, viz. 68° F.

Six private slipper baths are supplied by the mineral water raised to any required temperature by admixture of the same water heated artificially.

A second bathing establishment in which the mineral water only is in use is attached to the Royal Hotel, where also there is a swimming bath at 68° F., as well as reclining baths for both sexes, sitz and needle baths, douches of various kinds, in addition to Turkish and various sorts of medicated baths. Here also the water may be obtained for drinking purposes.

A third swimming bath supplied with the thermal water is attached to the New Bath Hotel.

We are indebted for information regarding the therapeutic effects of the Matlock waters to Dr. Holland and Messrs. Moxon and Innes, who state that treatment by the mineral waters and baths has proved effectual in gouty and rheumatic articular affections as well as in lumbago and sciatica.

At the present day the name of Matlock is associated rather with its extensive hydropathic establishments than with its thermal waters.

## BAKEWELL AND STONEY MIDDLETON

At two other places in Derbyshire, viz. Bakewell and Stoney Middleton, there are springs which somewhat resemble those of Buxton and Matlock, but which can hardly be described as thermal.

For information concerning these places we are indebted to Mr. Wrench of Baslow, who is, however, unable to give any analyses of the waters.

At Stoney Middleton the water has a temperature of 65° F., and is supplied to two small baths which are out of repair. It is sometimes employed for the treatment of rheumatic affections, and when other sources of village supply fail is used generally; but it is said to produce diarrhœa in some persons.

The Bakewell water has a constant temperature of 60° F., and the supply is somewhat intermittent, often varying many hundred gallons in a few hours. These variations bear no obvious relation to recent rainfall.

A bath house was erected in the year 1697. There is at present a plunge bath 36 feet  $\times$  15 feet, said to be of Roman construction. It has a solid arched stone roof, and the water enters through holes in the floor of the bath, as at Buxton. There are also three warm baths supplied with the water artificially heated.



## HARROGATE.

By MALCOLM MORRIS, F.R.C.S.E., AND F. PENROSE, M.D., F.R.C.P.

**Natural Advantages of the Place.**—Harrogate is remarkable for the number, variety, and richness in mineral constituents of the medicinal springs which well up from the depths of the earth within a very limited area. Before presenting a summary of the information relative to the therapeutic virtues of the different waters, and the special diseases in which they are of use, which has been obtained from the local medical practitioners, it will be well to pass briefly in review the natural features which give Harrogate its double character as a *health resort* and as a *watering place*. These may conveniently be dealt with under the heads of (1) Geological Formation, (2) Physical Features, (3) Climate, and (4) Mineral Springs.

**Geological Formation.**—Harrogate is situated at the end of an anticlinal axis which runs from the borders of Yorkshire and Lancashire on the west near Clitheroe, generally in an eastward direction, trending, however, north-eastwards just before it terminates abruptly in a great "fault" at Harrogate. The strata are mainly carboniferous, but at the "fault" just referred to the mountain limestone and carboniferous strata have been burst through, and a way has thus been opened for the sulphur wells which rise from great depths. The waters appear to find their way upwards through the interstices of the up-tilted strata, the latter forming partitions between one well and another and preventing the mingling of their waters. It is not unlikely, however, that the original subterranean source of wells of the same character—as, for instance, of many of the sulphur wells—is common to all of them. The difference, in chemical composition, as regards the saline and other solid matters contained in them, which the several waters present on reaching the surface, are no doubt due to differences in the channels by which the water rises to the

surface from the common underground reservoir. The geological conditions of Harrogate, as far as the waters are concerned, may be summed up in the statement that the wells are natural taps through which the waters lying between the various strata brought close together by the anticlinal axis, are forced to the surface by the "fault." Professor F. W. Johnstone is, however, of opinion that the wells are almost all independent of each other. This view is based on the following facts:—(1) That the saline and other constituents of each well are constant from year to year, but differ in different wells, however close to each other these may be situated; (2) That the levels maintained by the several springs differ one from another, though themselves constant.

The surface soil of Harrogate is for the most part composed of gravel and shale, thus absorbing moisture with great rapidity.

**Physical Features.**—The town of Harrogate consists of two parts called respectively High and Low Harrogate. Low Harrogate lies in a basin situated at the junction of three shallow valleys. The central one of these valleys rests directly on the apex of the great anticlinal above mentioned, and has a direction south-west to north-east; the south-western portion, that is to say, the upper part of the valley, is known as Harlow Hill, while the north-eastern end is at the Old Sulphur Wells. This is the central point of Low Harrogate. On the southern slope of this valley, namely, that looking north-west, at a distance of about a quarter of a mile from Low Harrogate and some eighty feet higher in level, is the Bog Field. Here, within an area of only a few acres, there are more than sixty wells. The following is John Phillips's description:—"It appears that the central one of the three valleys which converge to Low Harrogate is situate on the line of an axis of subterranean movement, technically styled the 'anticlinal axis,' from which the beds dip north-west and south-east at high angles of inclination. This central valley ranges north-east and south-west and opens by a gentle expansion into the slope of a considerable hill called Harlow Hill, at the foot of which expansion, and for a short distance up the slope in a line nearly north-west and south-east, in the midst of a boggy ground, rise at least a dozen of small wells or springs<sup>1</sup> yielding sulphurous

<sup>1</sup> At the present day, as already stated, at least sixty wells arise in the Bog Field.



and saline water, and there are also one or two springs of chalybeate waters." In the line of the central valley prolonged in the north-east direction no chalybeate or sulphur well is found until the ridges bounding it terminate; at this point there is a sudden change of direction in the strata which dip suddenly to the east-north-east. About forty yards from this cross fault ranging north-north-west are the four public sulphur wells at Low Harrogate, lying very close together. There are at least three other sulphur wells in the hollow beyond to the north-east, and a little to the east, and also to the north of the central line; the position is from 250 to 600 feet above the level of the sea, declining, from a central axis east, north and south with various undulations intersected by a shallow valley at Starbeck. As far as the waters are concerned the central valley, which has just been described, is the principal physical feature of Harrogate. The other two valleys—Cardale and Harlow Car—both contain sulphur and chalybeate springs. All the important wells of Harrogate lie in these three valleys. There are, however, some outlying springs, such as the Bilton Hall Well on the southern slope of the Nidd.

**Climate.**—Situated as Harrogate is midway between the Irish Sea and the German Ocean, at a considerable elevation, "it may be said to blend certain qualities derived from both coasts—dry and bracing from the east, with the harshness of that quarter tempered by the mellowing influences of the west, while the moisture of the latter is greatly reduced."<sup>1</sup> There are, in fact, two climates in Harrogate, the air being much milder in the basin than in the higher parts. The atmosphere of Harrogate is pre-eminently dry, this quality being due to the absence of forests, to the absence of large river beds and lakes, and to the absorbent nature of the soil. Meteorological records show that there are fewer rainy days at Harrogate than at most of the other English health resorts. The climate of Harrogate may fairly be described as highly bracing and, though somewhat cold in the winter, owing to its height above the sea level and the free play over it of air currents unbroken by natural barriers, the dry quality of the air makes the cold less disagreeable as well as less dangerous than might *a priori* be expected.

**Mineral Wells.**—The number of medicinal springs at Harro-

<sup>1</sup> Dr. G. Oliver, *The Harrogate Waters*, London, 1881, p. 6.

gate is about eighty, no two of them being exactly alike in their chemical composition. They may be broadly divided into a sulphur and an iron group. The following classification, taken from Dr. Oliver's book already referred to, displays in a convenient form the chief facts as to the chemical constitution of the principal springs:—

#### GROUP I. SULPHUR WATERS.

Class 1. **Pure Sulphur Waters.**—(Total solids *not more* than 20 grs. in 20 oz.)

Starbeck Sulphur Wells.

Bilton Sulphur Spring.

Harlow Car Sulphur Wells.

Class 2. **Saline Sulphur Waters.**—(Total solids from 30–130 grs.)

(a) *Strong.* (Total solids *not less* than 120–30 grs.)

The Old Sulphur Spring (Royal Pump Room).

Strong Montpellier Sulphur Well.

(b) *Mild.* (Total solids *not less* than 35 grs.)

Mild Sulphur Well (Royal Pump Room).

Mild Montpellier Sulphur Well.

Magnesia Well (the Bog Field and Royal Pump Room).

#### GROUP II. IRON WATERS.

Class 1. **Pure Chalybeate.**—(Total solids *not more* than 5 grs.)

Tewitt Spring. (The Stray.)

John's Spring. (The Stray.)

The Harrogate Pure Chalybeate (Royal Pump Room).

The Carbonate of Iron Well (Cheltenham Rooms).

Class 2. **Saline Chalybeate Waters.**—(Total solids from 27 to 109 grs.)

(a) *Strong.* (Total solids *not less* than 58 grs.)

Kissingen Well (Montpellier Gardens).

Chloride of Iron Well (Cheltenham Rooms).

(b) *Mild.* (Total solids *not less* than 27 grs.)

Alexandra Well (Royal Pump Room).

Class 3. **Sulphated Chalybeate.**—(Total solids nearly 50 grs.)

The Alum Well (the Bog Field).

The following analyses show the chemical composition of the



springs representing the two chief groups into which the Harrogate wells may be classified.

TABLE OF ANALYSES OF THE SULPHUR GROUP.

Saline constituents in grains per gallon.	Old Sulphur Wells: Royal Pump-room (Thorpel).	Strong Sulphur: Montpelier (Aitfield).	New or Mild Sulphur: Royal Pump-room (W. A. Miller).	Mild Sulphur: Montpelier (Aitfield).	Magnesia (Muspratt).	Starbeck Spa (Fairley).
Sodium sulphhydrate.	5.215	—	6.89	—	—	—
Sodium sulphide .....	—	14.500	—	8.777	.707	1.36
Barium chloride .....	6.566	—	trace	—	1.222	trace
Strontium chloride...	trace	2.816	—	.619	trace	—
Calcium chloride ...	43.635	79.936	16.70	31.296	—	—
Magnesium chloride.	42.281	57.989	2.39	27.589	1.792	—
Potassium chloride...	9.592	4.811	11.34	5.691	27.913	—
Lithium chloride.....	.753	trace	trace	—	trace	trace
Ammonium chloride.	1.031	.996	—	.656	trace	trace
Sodium chloride .....	893.670	827.371	582.95	388.800	215.896	116.44
Magnesium bromide.	2.283	—	—	—	trace	trace
Magnesium iodide ...	.113	—	—	—	trace	trace
Calcium carbonate ...	29.768	8.750	23.20	16.711	18.476	10.01
Magnesium carbonate	5.953	—	—	—	12.799	3.51
Potassium carbonate.	—	—	—	—	—	.65
Sodium carbonate ...	—	—	—	—	—	14.47
Barium sulphate.....	—	.418	—	—	—	—
Strontium sulphate..	—	.529	—	.913	—	—
Calcium sulphate ...	—	—	—	—	—	1.88
Sodium nitrate .....	—	.900	—	.370	—	—
Silica .....	.701	3.570	2.40	3.836	1.608	3.27
	1047.561	1002.586	645.87	485.258	280.413	151.59

GASES IN CUBIC INCHES.

Saline constituents in grains per gallon.	Old Sulphur Wells: Royal Pump-room (Thorpel).	Strong Sulphur: Montpelier (Aitfield).	New or Mild Sulphur: Royal Pump-room (W. A. Miller).	Mild Sulphur: Montpelier (Aitfield).	Magnesia (Muspratt).	Starbeck Spa (Fairley).
Sulphuretted hydrogen	10.16	—	4.18	—	—	—
Carbon dioxide ... ..	40.10	60.00	13.22	54.00	11.50	—
Carburetted hydrogen ..	—	2.30	—	.80	—	—
Nitrogen ... ..	—	3.70	2.01	3.20	—	—
	50.26	66.00	19.41	58.00	—	—

TABLE OF ANALYSES OF THE SALINE CHALYBEATE AND IRON GROUP.

Saline constituents in grains per gallon.	Kissingen Spa (Atfield).	Chloride of Iron Spa (Thorpe).	Alexandra Chalybeate (Davis).	Carbonate of Iron Spa (Muspriatt).	Pure Chalybeate Royal Pump (Davis).	Tewitt Well (Hofmann).	John Well or Old Spa.	Alum Well (Davis).
Ferrous chloride .....	—	13·213	—	—	—	—	—	—
Ferrous carbonate ...	9·590	11·050	5·800	6·042	1·364	1·358	1·271	—
Ferrous sulphate.....	—	—	—	—	—	—	—	69·33
Ferric sulphate .....	—	—	—	—	—	—	—	78·76
Aluminium sulphate.	—	—	—	—	—	—	—	89·47
Calcium sulphate ...	—	—	9·097	7·625	·749	·697	·307	56·91
Magnesium sulphate.	—	—	—	—	—	—	—	57·38
Potassium sulphate...	—	—	—	—	—	—	—	3·14
Ammonium sulphate	—	—	—	—	—	—	—	2·19
Barium sulphate .....	·509	·222	—	—	—	—	—	—
Potassium chloride ...	21·425	3·205	1·130	·150	—	1·323	—	—
Sodium chloride .....	674·598	277·561	176·370	11·650	1·625	·280	1·543	33·96
Ammonium chloride.	·439	·406	trace	—	trace	trace	trace	—
Barium chloride .....	—	5·204	—	—	—	—	—	—
Strontium chloride...	·887	·624	—	—	—	—	—	—
Calcium chloride.....	87·337	94·015	—	2·311	—	—	—	—
Manganese chloride...	—	·971	trace	—	trace	trace	—	—
Magnesium chloride.	65·391	57·315	4·735	13·148	—	—	—	—
Lithium iodides, bromides, fluorides }	traces	traces	traces	—	traces	traces	—	—
Barium carbonate ...	2·136	—	—	—	—	—	—	—
Calcium carbonate ...	8·858	—	13·762	·341	1·532	1·435	2·264	—
Magnesium carbonate	—	—	5·785	—	1·952	2·667	3·039	—
Potassium carbonate.	—	—	—	—	·262	1·057	·991	—
Sodium carbonate ...	—	—	—	—	1·103	—	1·338	—
Silica.....	3·570	1·414	·675	·204	·502	1·041	trace	3·27
Organic matter .....	—	—	1·450	—	·750	·663	trace	—
	874·740	465·200	218·804	41·471	9·839	10·521	10·753	394·41

## GASES IN CUBIC INCHES.

Saline constituents in grains per gallon.	Kissingen Spa (Atfield).	Chloride of Iron Spa (Thorpe).	Alexandra Chalybeate (Davis).	Carbonate of Iron Spa (Muspriatt).	Pure Chalybeate Royal Pump (Davis).	Tewitt Well (Hofmann).	John Well or Old Spa.	Alum Well (Davis).
Carbon hydrogen ...	21·3	53·55	17·04	—	13·74	11·85	14·95	—
Carburetted hydrogen	—	—	—	—	—	—	·15	—
Oxygen.....	1·5	—	·31	—	·82	·40	·67	—
Nitrogen .....	5·2	—	8·98	—	8·00	5·53	6·35	—
	28·0	—	26·33	—	22·56	17·78	22·12	—



For further particulars as to the several mineral constituents of the waters, and a detailed comparison of them in respect of their chemical composition with the waters of other spas, English and foreign, Dr. Oliver's book may be consulted with advantage. It is sufficient here to state that in the waters of Harrogate the following medicinal substances are present in perfect solution in various proportions in the different waters, and for the most part in sufficient quantity to have a definite therapeutic effect :

**I. Chlorine combinations :—**

- (a) The alkaline chlorides.
- (b) The chlorides of magnesium and calcium.

**II. Barium Salts :—**

Chloride and carbonate.

**III. Sulphides :—**

- (a) Sodium sulphide.
- (b) Hydrogen sulphide.

**IV. Iron Salts :—**

- (a) Proto-carbonate.
- (b) Proto-chloride.
- (c) Sulphates (proto and per).

All the Harrogate waters are non-thermal. The sulphur and chloride of iron waters are, however, artificially heated for drinking purposes by an apparatus called the "Therma." This consists of coils of pipes enclosed in a hot water chamber which can be heated to any temperature likely to be required ; through these pipes the mineral waters are conveyed without losing any portion of their gases and without precipitation of the solid constituents which they hold in solution. The sulphur waters are also used externally, either as lotions or local or general baths ; and in addition to the ordinary immersion baths special provision is made for the application of the medicinal water in the form of sprays, vapour, douche, "needle" baths, &c. On theoretical grounds, therefore, the claims of Harrogate to a high place among health resorts and watering places would seem to be fully justified.

**The Testimony of Local Medical Practitioners.**—In order that our knowledge of the natural advantages of Harrogate might be tested and supplemented by such evidence as to its practi-

cal effects as could be obtained from those who had had the best opportunities of observing them, what may be described as an informal Committee of Inquiry was held on the spot. The medical men engaged in the practice of their profession at Harrogate were invited to supply information to the commissioners personally on certain definite points. The interrogatories related to—(1) the climate, the classes of invalids for whom it was suitable, or the reverse; (2) the time of the year when the beneficial effects of the climate were most pronounced; (3) the relative importance of the various springs; (4) the personal experience of the practitioner as to which diseases were most distinctly benefited, and (5) as to which diseases, if any, were unsuitable for treatment at Harrogate; (6) the best mode of using the waters—internally, externally, or in both ways combined; (7) which waters were the most suitable for bathing purposes; (8) any literature relative to Harrogate, to which the practitioner might wish to call attention, and (9) any remarks which he might desire to make; (10) lastly it was asked if, in the opinion of the practitioner, analyses should be made independently. The practitioners were also invited to give their experience as to the effect of the Harrogate waters in gout and gouty affections, osteo-arthritis or rheumatic gout, rheumatism, muscular rheumatism, gonorrhœal arthritis (or gonorrhœal rheumatism), sciatica, syphilis, tuberculous and scrofulous affections, anæmia, diseases of the skin with special reference to eczema and psoriasis, diabetes and glycosuria, urinary and renal diseases, diseases of the respiratory system, diseases of the circulatory system, diseases of the digestive system (including the liver), diseases of the nervous system, diseases of women, and the results of injury. They were also requested to state the conditions in which they thought the use of the waters contra-indicated (*a*) by the character of the disease proposed to be treated; (*b*) by the state of the patient apart from the disease proposed to be treated.

The information received from these gentlemen is here summarised under the several heads of the inquiry.

**Climate and Time of Year.**—With regard to the climate of Harrogate, the practitioners were unanimous as to its tonic and stimulating qualities, but there was some divergence of opinion as to the time of year when invalids were likely to derive most



benefit from it. Thus while some thought the climate good for invalids all the year round, others thought it unsuitable during the winter months, and others again during the spring. The majority were agreed that chest cases were unlikely to derive benefit during the cold weather, but while this period was by some defined as including November, December and January, by others it appeared to be limited to February, March and April. One practitioner referred to the prevalence of dry east winds during the three spring months. On the whole, the testimony of the Harrogate practitioners would seem to show that while cases of skin and liver diseases, gout and rheumatism do as well there in the winter as in summer, in cases of bronchial trouble and active phthisis the place is suitable only between May and October. Asthmatics sometimes improve during the winter, but their complaint exhibits the same capriciousness at Harrogate as elsewhere, some sufferers being unable to live in High, and others in Low, Harrogate. It was mentioned by one or two practitioners that the natives of Harrogate were healthy, and live, as a rule, to a good age; phthisis was said to be rare among them, but they were not exempt from chronic rheumatic affections.

**Importance of the Various Springs.**—In the saline-sulphur group the medical practitioners of Harrogate with one voice place the Old Sulphur Spring first. There is a consensus of opinion that the chlorides in that water give it a special therapeutic value. The barium chloride in particular is said to make it possible for patients to take the sulphur for a long time together, so that the full measure of benefit can be derived from its action, without danger of depression of the heart's action. As regards the other sulphur wells, individual preferences were expressed for the "strong" and the "mild," according to circumstances. Among the pure sulphur waters the Starbeck Sulphur Wells seem to be most in favour. Of the iron group, the saline chalybeate waters of the Kissingen and Chloride of Iron Wells appear to be most frequently prescribed.

**Diseases most benefited.**—The sulphur waters are, in the experience of the local practitioners, most useful *internally* in plethoric conditions, constipation, conditions associated with the presence of uric acid, defective action of the liver, recurrent hepatic colic, bilious disorders, and, broadly speaking, all hepatic

troubles not due to organic diseases, gastro-intestinal catarrh and digestive disturbances generally, gout and rheumatism, acute and chronic, and plumbism. One practitioner particularly mentioned the beneficial effect of the Old Sulphur Well water in malaria or its consequences. *Externally*, the mild sulphur water is found very useful in skin diseases, especially eczema and psoriasis; it also does good in lupus erythematosus.

The chalybeate waters are especially useful in cases of anæmia and chlorosis, albuminuria, diabetes, convalescence from protracted or weakening illness, debility, chronic rheumatoid arthritis and scrofula.

**Diseases unsuitable for Treatment at Harrogate.**—Generally speaking, cases of organic disease of the heart, blood-vessels, liver and kidneys, are unsuitable for treatment at Harrogate, except in the very early stages. In cases of any kind in which high arterial tension is present, and especially if there is reason to suspect organic cerebral mischief, the Harrogate waters, both sulphur and iron, are contra-indicated as tending to produce apoplexy, &c. Some think the waters contra-indicated in all forms of acute disease, including affections of the skin, but this opinion is not shared by other practitioners of equal experience. In cases of asthma and in insomnia and neurotic conditions generally, Harrogate is admitted by most to be unsuitable. In cases of asthma, it is sometimes suitable, sometimes the reverse.

**Treatment: Internal, External, or Combined.**—In functional disease of the liver, gastro-intestinal canal, or kidneys, in plethoric or gouty conditions, in chlorosis, especially of the variety described by Sir Andrew Clark as "fæcal anæmia," in albuminuria, in diabetes, and in the exhaustion following influenza and other weakening diseases, the *internal* use of the Harrogate waters is indicated. Each case must, of course, be treated in strict accordance with its individual requirements, but the following may be given as a kind of general formula for the internal administration of the waters: Begin with sulphur and follow up with iron. The waters of the Old Sulphur Well should be drunk for a few days in order to stimulate the action of the liver, kidneys, lungs and skin; this, as one of the practitioners put it, "clears out the sewage works" and brings the system into a condition in which it can receive the greatest amount of benefit from the iron waters.



Some practitioners order the "strong" sulphur water to be taken in the morning as an aperient, the "mild" being taken later in the day. The action of the latter is mildly diuretic, diaphoretic, and alterative. The internal use of the "strong" sulphur water is contra-indicated in cases of extreme anæmia. The preliminary sulphur course may, in the absence of any definite contra-indication, be followed with advantage by a course of the chalybeate waters; the Kissingen is the spring generally preferred by the Harrogate practitioners for this purpose. In cases in which the eliminative functions are inadequately performed, a course of "mild" sulphur water is often usefully combined with the chalybeate treatment, the former being taken an hour or so before breakfast, the iron after that meal. Some practitioners, however, object to the sulphur and the iron waters being taken on the same day. The opinion was expressed by some of the gentlemen who kindly gave the results of their experience that the water treatment can be considered only an adjuvant to ordinary pharmacopœial remedies; the more skilfully the latter are adapted to the waters so as to complement and co-operate therapeutically with them, the more satisfactory will be the results.

The *external* use of the waters is indicated in gouty and rheumatic conditions, and in certain skin affections, notably eczema and psoriasis. In chronic gout and rheumatic arthritis, and in stiffening of joints from other causes, "strong" thermal sulphur baths and local applications in the form of the Aix douche, the "needle," &c., are often of great use. Local applications are also sometimes beneficial in incipient gout and rheumatism. The "descending" douche is used as a spinal stimulant; it is found serviceable in some cases of insomnia, torpidity of the liver, &c. The Aix douche acts as a stimulant to the circulation, and in this way is often useful in rheumatic conditions. The use of the needle bath, especially if continued for some time, frequently sets up healthy reaction. The "strong" sulphur baths are also useful in chronic forms of skin disease, especially psoriasis; when the inflammatory process is still active the "mild" sulphur wells, and the "pure" sulphur waters are more beneficial. These can be used either for total immersion or for local baths. The latter, however, are not generally considered to be of much use as compared with total immersion. Some practitioners think the douche

useful only by its mechanical effect. With regard to the action of the sulphur baths in diseases of the skin, it may be stated in general terms that when a stimulating effect is wanted, the "strong" waters are indicated, and when a sedative effect is desired the "mild" waters (Starbeck and Harlow Car) should be chosen. Some practitioners do not hesitate to treat cases of acute eczema by sulphur baths, but this has occasionally been followed by intense exacerbation of the symptoms. It is well known, however, that when the treatment has been continued for some time, what is called a "crisis" is apt to occur; this is nothing but a form of artificial dermatitis induced by the action of the hot water impregnated with sulphur on the skin.

The presence of disease of the heart contra-indicates the use of thermal sulphur baths, and patients in whom the action of that organ is at all weak should be carefully watched during the treatment.

The internal use both of the sulphur and the iron waters may advantageously be combined with the external use of the former in cases of gout, rheumatism, plethora, defective elimination, some forms of chlorosis, and in diseases of the skin. Generally speaking, a course of internal treatment (sulphur to cleanse, followed by iron to reconstitute) may usefully be combined with baths or other forms of local application in the case of otherwise healthy individuals who are suffering from general sluggishness of the eliminative and assimilative processes; the combination is most frequently indicated in cases of gout, rheumatism, and chronic skin disease.

**Waters most suitable for Bathing.**—*Stimulant*: Victoria and Montpellier ("strong" and "mild"). *Sedative*: Starbeck and Harlow Car.

**Literature.**—The following is a list of the works bearing on Harrogate and its waters to which attention was called by the practitioners who supplied information:—

Dr. Black's *Harrogate* (1884). In Ellis's Series, *Health Resorts of Northern England*.

Dr. J. L. Hobson, *The Cause and Treatment of Eczema*.

Dr. Lavis, *The Prescriber's Guide to the Harrogate Mineral Waters*.

Dr. A. S. Myrtle, *Practical Observations on Harrogate Mineral Waters; Chronic Diseases at Harrogate Spa, &c.*



Dr. G. Oliver, *The Harrogate Waters: Data, Chemical and Therapeutical, with Notes on the Climate of Harrogate*. London: 1881 (H. K. Lewis).

**Remarks.**—With regard to the springs, several practitioners stated that they had found the Kissingen Well most useful in cases of albuminuria and diabetes, the Alexandra for scrofulous children, and the Chloride of Iron Well for chlorosis. By others again Kissingen is preferred for chlorosis, and the Chloride of Iron (Muspratt Well) for diabetes. One gentleman thinks Kissingen contra-indicated in Bright's disease, and in polyuria of nervous origin. The Chloride of Iron water, it was pointed out, is not so easily digested as the water of the Kissingen Well, and for most people the Kissingen itself is greatly improved by the addition of Carbonic Acid Gas. Some practitioners find the Chloride of Iron valuable (as an adjuvant to the climate) in lupus; others again find it serviceable in incipient phthisis and other forms of tubercle, but comparatively useless in lupus. Stress is laid by some on the necessity of a generous diet for patients while they are drinking the sulphur waters. One practitioner stated that he was making observations on the amount of urea excreted by patients taking the sulphur waters, but his researches not being completed his results were not available. Another gentleman called attention to the special value of No. 36 Well in irritability of the heart following influenza. Another said he considered the Tewit and St. John Wells particularly valuable as tonics for children. It was suggested by one gentleman that after a course of Harrogate waters patients should go on to Droitwich for a complementary course of treatment. Special importance, as already said, was attached by several practitioners to the presence of barium, both in the sulphur and in the iron waters, owing to the tonic effect of that substance on the heart and arterial system; it was said by some to be particularly beneficial in gastric cases.

**Gout and Gouty Affections.**—The information received from the Harrogate practitioners as to the treatment of gout and gouty affections by the waters may be summarised as follows:—All agree that for *internal administration* the Old Sulphur Well is the most generally useful of the springs; it is, however, unsuitable in cases of advanced gouty disease of the kidney. Some think that it is contra-indicated in acute forms of gout. Some recommend the

Old Sulphur Well water to be taken in the morning as an aperient and a mild sulphur water (including the Magnesia Well) during the day. Some make it a rule to start treatment with the sulphur water and finish with chalybeate. As regards *external administration*, few practitioners seem to employ it. Some, however, recommend immersion in mild sulphur water, especially that of the Starbeck Spring. Some think the Aix douche useful for stiff joints. One uses strong sulphur baths.

**Osteo-Arthritis, or Rheumatic Gout.**—*Internal Administration.* All, with one exception, agree that the Old Sulphur Well is most useful in chronic rheumatic arthritis. Some use both the strong and the mild sulphur waters, finishing with a course of Kissingen or Chloride of Iron water. One practitioner, who has not seen any form of treatment at Harrogate do much good in this condition, states that he has occasionally found the Chloride of Iron water useful in such cases.

*External Use.* The opinions of practitioners on this point, though presenting considerable divergence, are on the whole in favour of the usefulness of immersion in the thermal sulphur baths. As regards local applications, such as partial baths, needle baths, Aix douche, &c., opinions are about equally divided as to their utility; the Aix douche, on the whole, finds most favour.

**Rheumatism and Muscular Rheumatism.**—*Internal Administration.*—All agree that the Old Sulphur Well is very useful in these conditions; some, however, consider it contra-indicated in acute rheumatism.

*External Administration.*—Strong sulphur baths are considered useful by most of the practitioners, but they all agree that mechanical applications, such as Aix douche, needle bath, &c., are the most important.

**Gonorrhœal Arthritis.**—*Internal Administration.*—About half of the practitioners speak favourably of the Old Sulphur Well. One who is entitled to speak with authority thinks the sulphur waters of little use, but speaks well of the Chloride of Iron Spa. Another recommends the sulphur treatment first, and follows it up with a course of chloride of iron.

*External Administration.*—Of the three practitioners who refer to the external use of the waters in this condition, two speak



favourably of the Aix douche and the other recommends sulphur baths combined with the internal treatment.

**Sciatica.**—This condition is especially referred to only by one practitioner, who thinks the Old Sulphur Well useful.

**Syphilis.**—The practitioners are practically unanimous as to the value of the Chloride of Iron and Kissingen Springs as general tonics.

**Tuberculous and Scrofulous Affections.**—With regard to phthisis there is some difference of opinion, for while some practitioners hold that even advanced cases do well at Harrogate, even in winter, others think that the winter months are unsuitable for such cases, and others again say that Harrogate is in all seasons unsuitable for cases of active phthisis. The iron waters are recommended by some in tuberculous conditions, and one practitioner says the Alexandra Well is specially valuable for scrofula in children.

**Anæmia.**—*Internal Administration.*—All agree that the iron waters are useful in anæmia. The Chloride of Iron Spa is unanimously looked upon as the most useful of the iron wells, but it is apt to disagree. The Kissingen and milder iron waters are also useful in anæmia. The use of strong sulphur waters in cases of pronounced anæmia is strongly condemned by some. In anæmic conditions generally, the milder sulphur waters are said to be indicated for laxative purposes, if any be used.

**Diseases of the Skin.**—As regards the *internal* administration of the Harrogate waters in skin diseases, the Old Sulphur Well is believed by one or two practitioners to be beneficial in all skin diseases; others think those associated with chronic gout most suitable for treatment. Several say that the sulphur waters are contra-indicated in acute cases. One states that pruriginous diseases are generally improved by a combination of the sulphur and the iron treatments.

*Externally* there is a pretty general agreement as to the value of strong sulphur baths in non-inflammatory skin affections, and in chronic forms of eczema and psoriasis. In acuter forms mild sulphur baths are indicated.

**Glycosuria.**—Most of those who specially referred to this condition agreed that the iron waters (Kissingen and Muspratt Well) are beneficial in diabetes. One practitioner thinks sulphur

useful, and another says that Harrogate is contra-indicated for diabetes.

**Urinary and Renal Diseases.**—Several speak well of the effect of the weaker chalybeate springs in slight cases; others think all cases of Bright's disease, except gouty kidney in the early stages, are unsuitable.

**Diseases of the Respiratory System.**—The opinions of the practitioners on this subject have already been summarised.

**Diseases of the Circulatory System.**—There is a general agreement that the place and treatment are suitable unless there be organic lesion of the heart or vessels, when the latter is contra-indicated.

**Diseases of Digestive System (including Liver).**—All the practitioners agree that these cases are much improved unless there be any serious organic flaw.

Nearly all agree that the most useful mode of treatment is to begin with strong sulphur waters (Old Sulphur Well), continue with weaker sulphur water, and finish with the Kissingen Well, or some combination of treatment with sulphur and iron, a certain interval being allowed between the administration of these waters.

Such conditions as torpid liver, faecal anæmia, &c., &c., are generally considered to be the most suitable of any for treatment at Harrogate—especial stress being laid on the value of the Old Sulphur Well and Muspratt—from their containing barium chloride, which is said to act as a heart-tonic during long periods of purgation. The Chloride of Iron Well, for the same reason, is considered very valuable in the same relation, on account of the barium chloride it contains.

One practitioner specially mentions that the sulphur waters are good for recurrent hepatic colic, provided there be no organic change.

**Diseases of the Nervous System.**—No general statements as to diseases of the nervous system were offered, except that cases of serious organic change were unsuitable.

**Plumbism.**—Opinions were practically unanimous that great benefit is derived from the internal administration of the strong sulphur waters.



## HARROGATE.

Abstracted from the Meteorological Record,

Amount of Humidity, Wet Bulb.	January.		February.		March.		April.		May.		June.		July.		August.		September.		October.		November.		December.		Average Total.			
	Rain, Amount.	Rain, number of Days.	Amount of Humidity.	Amount of Cloud.	Rain, Amount.	Rain, number of Days.	Amount of Humidity.	Amount of Cloud.	Rain, Amount.	Rain, number of Days.	Amount of Humidity.	Amount of Cloud.	Rain, Amount.	Rain, number of Days.	Amount of Humidity.	Amount of Cloud.	Rain, Amount.	Rain, number of Days.	Amount of Humidity.	Amount of Cloud.	Rain, Amount.	Rain, number of Days.	Amount of Humidity.	Amount of Cloud.	Rain, Amount.	Rain, number of Days.	Humidity.	Cloud.
1887 01 71 76	18 86 5 7	66	10 84 0 4	1 28	11 78 0 9	71	12 78 8	5 2 08	14 77 0 9	08	3	71 5 0	1 01	11 17 0 6	9 2 72	12 85 7 9	3 59	15 83 7 2	2 22	14 89 0 8	2 37	25 90 0 4	1 41	17 82 6 9	21 56	160		
1888 01 78	48	18 92 7 2	1 05	16 85 7 0	4 59	17 82 8 2	2 83	18 75 6 2	92	8	86 8 3	5 51	14 84 7 8	5 59	21 86 7 0	9 27	18 85 8 1	68	12 84 6 9	65	6	92 8 4	5 04	26 94 7 7	1 70	11 86 7 5	29 30	182
1889 02 75	90	15 90 6 8	1 45	14 86 6 9	2 03	14 86 8 3	0 95	21 86 7 3	01	15 80 6 5	34	2	81 6 8	12 89 7 6	3 57	21 88 7 3	01	12 90 8 9	4 18	21 05 7 8	09	12 92 7 0	1 07	14 89 7 4	23 08	178		
1890 02 69 3	22	23 93 8 5	1 08	14 88 8 8	2 05	20 80 7	88	14 79 6 3	2 47	11	80 7 2	2 61	14 76 7	1 68	18 83 6 9	4 48	19 85 7 3	52	52	18 85 6 1	22	18 92 7 9	3 96	26 90 8 6	08	10 85 7 3	26 00	211
1891 02 66 41	39	29 89 6 4	07	4	83 6 2	52	22 83 8 0	2 14	15 78 7 7	1 48	21	82 8 3	1 34	10 75 7 3	8 80	14 82 8 0	3 40	22 82 0 3	51	19 86 0 2	78	22 91 7 6	3 14	24 91 6 8	4 19	22 84 7 1	28 16	211
1892 02 72 1	55	19 89 7 2	43	08	81 6 8	1 49	14 71 6 7	1 53	11 74 7 3	3 09	19 77 7 6	4 15	17 80 8 0	1 16	13 80 7 1	3 17	19 81 0 7	1 40	14 87 6 2	6 26	24 90 7 4	1 49	18 90 5 6	84	12 83 7 9	29 38	199	





## ASKERN SPA.

ASKERN SPA, near Doncaster, in the West Riding of Yorkshire, has long been known on account of its mineral waters rich in sulphuretted hydrogen. In a paper recently communicated to the Chemical Society of London,<sup>1</sup> Mr. C. H. Bothamley, F.C.S., F.I.C., thus describes its situation:—

“The village stands on the edge of an extensive plain, a large part of which is uncultivated and imperfectly drained peat bog. It is built on strata belonging to the Permian formation, and steep hills of magnesian limestone rise close behind the village on the west. Red Permian marls, containing thin beds of gypsum also occur in the immediate neighbourhood. To the east of the highroad that runs through the village is a sheet of water, about six acres in extent, known as ‘the pool.’ It is fed partly by springs and partly by the drains or streams from the common. The sulphuretted springs are situated not far from the edge of the pool, to the west and south-west.”

There are four sulphuretted wells, the most recent analyses of which are also embodied in Mr. Bothamley's paper. He states that the Askern waters rise from no great depth, being almost surface waters.

The dissolved solids, which only amount to about two parts per 1,000, consist chiefly of calcium carbonate and calcium and magnesium sulphates. Very small quantities of chlorides are present. The whole of the hydrogen sulphide present is in the free state, and the amount contained in the strongest waters reaches 50 c.c. per litre. Mr. Bothamley attributes the presence of this gas to reduction of sulphates brought about in some hitherto undetermined way. The waters are highly charged, if not saturated, with organic matter derived from the peat.

<sup>1</sup> *Trans. Chemical Soc.* 1893, p. 685.

The results of the analyses are as follows. The quantities are expressed in grains per gallon.

PROXIMATE COMPOSITION OF THE DISSOLVED INORGANIC MATTER.

	Town End Baths.	Terrace Baths.	Charity Baths.	Manor Baths.
Calcium Carbonate ... ..	58.92	57.62	47.78	46.89
Calcium Silicate ... ..	1.97	1.83	3.10	3.14
Calcium Sulphate ... ..	36.55	31.04	34.57	36.06
Magnesium Sulphate ... ..	27.12	30.02	50.29	47.84
Sodium Chloride ... ..	2.42	6.92	8.33	8.44
Sodium Sulphate ... ..	2.98	1.54	4.61	4.19
Total dissolved inorganic matter	129.96	128.97	148.68	146.56
Hydrogen Sulphide in cubic ins.	15.73	13.74	9.66	10.35

A pump room and set of baths are now attached to each of the four springs.

(1) The South Parade or Town End Bath-House contains four baths with one shower bath. The water is here heated for use in a boiler.

(2) The Terrace Bath-House contains five baths of ordinary size and modern make. Here the water is heated by steam.

(3) The Charity Baths, supported by local subscriptions, comprise four baths (one with shower). The water is heated by means of steam in a jacket boiler.

(4) The Manor Bath-House contains eight baths (seven full sized and one sitz) and hot and cold shower. Some are of enamelled iron and others of grey marble. Here the water is heated by forcing steam into it.

In no case is hot water added to the sulphur-water so as to dilute it.

The waters are taken internally in doses of about half a pint twice or thrice daily. Their action is usually diuretic, less often laxative. They are usually taken cold. The water is slightly effervescent, of a yellowish tint, and of strong sulphurous taste and odour. The yellow tint is probably due to its origin in the peat bog.



The conditions in which most benefit is derived from treatment at Askern are stated to be,

- (1) *Subacute and chronic gouty conditions.*
- (2) *Rheumatic and rheumatoid affections*, especially when attended with rigidity of joints and pain.
- (3) Some *chronic skin diseases*, viz., chronic eczema, psoriasis, pityriasis. In cases of eczema and psoriasis the absence of sodium chloride is an advantage.
- (4) Some forms of *dyspepsia* and *liver affection*.

For the information upon which this report is based we are indebted to the paper of Mr. Bothamley already referred to, and to Mr. Hindle, Dr. Cassells, and Mr. Rowley of Askern.

## DROITWICH.

By ARCHIBALD E. GARROD, M.D., F.R.C.P.

DROITWICH is situated in Worcestershire at a distance of about seven miles from the city of Worcester and of one hundred and twenty-five miles from London. The town itself is by no means attractive, although containing some picturesque old houses. As in the salt districts of Cheshire, the undermining of the town by the gradual solution and removal of the beds of rock-salt which underlie it leads to very conspicuous subsidences. In the older parts of the town the floors of the houses slope in all directions, and buildings are pointed out which are gradually sinking into the earth, several feet of wall, or even an entire story, having disappeared from view within the memory of the present inhabitants.

If, however, the place itself is wanting in beauty the same cannot certainly be said of the fertile, undulating valley in which it lies, which is bounded by the Lickey and Clent Hills, Abberley and Woodbury and the Malvern Hills, and is watered by a small tributary of the Severn which flows through the town.

I am indebted to Mr. Jones for the following facts relating to the geology of the district:—

The Lickey Hills are composed of permian rock which dips in a southern direction below the new red sandstone, thus separating these strata from the old red sandstone, which here forms a kind of trough filled up by the new red marl. Droitwich lies over what is nearly the deepest portion of this trough. Parkinson gives the following as a section of borings made in 1883.

The surface is covered by a black peaty soil to a depth of some fifteen to twenty feet. The next six feet are composed of quick-sands with fresh water springs and beds of gravel in places. Then



follow forty feet of red marl, and afterwards 140 feet made up of bands of gypsum, red marl, collections of rock salt, red sandstone, &c., and lastly a very hard crust of gypsum from twelve to eighteen inches in thickness, immediately under which lies the rock salt. This salt is being constantly dissolved by streams of pure water which flow over it, and is pumped up as brine.

It appears that these salt beds are the remains of inland seas or lagoons, and they are probably connected with the other English salt beds, since all such deposits in this country have the same north-easterly lie.

It is conjectured that a species of reservoir exists beneath the old part of the town at a depth of 200 feet, and the direction of the streams which supply this reservoir is believed to be indicated by lines of subsidence which may be traced in different directions for several miles.

Droitwich is the seat of a considerable salt industry and possesses a Salters' Hall. It is believed that the brine was used for medicinal purposes as early as the period of the Roman occupation of Britain, and Roman coins have been found on digging in the high street of the town.

**Characters of the Brine.**—The supply of brine is unlimited, and is used without stint for the various baths. As it comes up from the earth it has the following composition according to the analysis of Herapath :—

Sodium Chloride ... ..	21,761·872	grains per gallon.
Magnesium Chloride ... ..	2·560	" " "
Calcium Sulphate ... ..	91·120	" " "
Aluminium Sulphate ... ..	14·400	" " "
Sodium Sulphate, ... ..	342·720	" " "
Sodium Iodide ... ..	0·208	" " "
	<hr/> 22,212·880	

The various analyses give rather different amounts of sodium chloride.

Horner ... ..	21,585·5	grains per gallon.
Daubeny ... ..	16,910·0	" " "
Northcote ... ..	19,392·57	" " "
D. T. Taylor ... ..	21,509·77	" " "

Northcote also found carbonates of sodium and magnesium in small quantities.

To illustrate the strength of the solution I may mention that according to Schweitzer the sea in the Channel contains only 1,946.09 grains of sodium chloride per gallon.

The specific gravity of a specimen of brine sent to me by Mr. Cuthbertson was found to be 1.195.

The waters are practically only used for bathing purposes. The late Dr. Roden states that if swallowed in an undiluted form the brine is powerfully emetic and purgative, the purgation being attended with horrible griping. He adds that it is occasionally taken diluted, one or two tablespoonfuls being added to half a pint of water, when it acts as a very comfortable and efficient aperient.

**Methods of Bathing.**—The baths, which are all private property, are located in two establishments, viz., the older Royal and the new St. Andrew's Baths, which were completed in 1887.

The Royal Baths are situated in the town, whereas the St. Andrew's Baths are pleasantly placed on the border of the open country.

Immediately adjacent to the Royal Baths is an hotel with which they are connected by a glazed corridor, so that the patient can go from his room to the bath without having to pass through the open air.

There are also two large hotels quite near the St. Andrew's Baths, and from the newer of these it is proposed to construct a subway to the bath-house opposite.

At both establishments the arrangements are excellent, and especially at the St. Andrew's Baths, where all modern improvements have been introduced.

In this establishment there are only first and second class baths. On the men's side there are ten first class private baths, each of which is approached from two dressing rooms, thus allowing of the refilling of the baths without unnecessary loss of time.

The baths are oval in shape, and are constructed of teak wood throughout. They hold between sixty and sixty-five gallons. A bar of wood is fixed across the centre of the bath at a suitable height, and serves to keep the patient immersed, such assistance being rendered necessary by the extreme buoyancy of the brine. There is, moreover, an arrangement for adjusting a second bar across the chest if desired. These baths are usually given at a



temperature of  $98^{\circ}$ — $101^{\circ}$ , and the time of immersion is about twenty minutes.

The second class men's baths, twelve in number, are similarly constructed, but there are no separate dressing rooms.

The ladies' baths, twenty-two in number, resemble the men's.

The brine used in the baths is heated by the addition of hot water, but here this method of heating has no disadvantages, since the almost saturated liquid is too concentrated for use, and requires to be diluted with water to about twice its bulk. Dr. Roden says that any attempt to heat the pure brine leads to crystallization as soon as any evaporation takes place, and thus to blocking of the pipes.

In addition to the private baths there are swimming baths for both sexes. The men's swimming bath, which is the larger, is seventy-five feet long by thirty-five broad, and its depth varies from three to six feet. It is lined throughout with white tiles. The water in the swimming bath has a brown tint, which is said to be heightened by the reflection from the varnished wooden roof. Numerous spittoons are fastened round the edge of the bath and serve for the expectoration of any brine which may enter the bather's mouth. Showers of fresh water can be taken after swimming if desired. The water is heated to a temperature of  $85^{\circ}$ — $88^{\circ}$  by jets of steam discharged from an iron pipe under the surface.

The St. Andrew's Baths also include a douche room fitted with douches, vapour and needle baths. The diluted brine is employed in the douches and needle baths, but it rapidly acts upon the metallic fittings, which require to be frequently renewed.

At the Royal Baths the first and second class baths are constructed of wood, but those of the third class are made of Stourbridge pottery. The arrangements of the dressing rooms are less modern and luxurious than at the St. Andrew's establishment. Here also there are swimming as well as immersion baths.

As accessory methods of treatment massage and electricity are employed, and brine compresses are frequently applied over diseased joints with marked benefit.

The Droitwich baths are open all the year round, and are visited by patients all through the winter, but there is a consensus of local medical opinion in favour of the summer months as those in which the treatment is best undergone.

There can be no doubt that the brine baths of Droitwich have very potent effects, both physiological and therapeutical.

A bath in the diluted brine is followed by a great sense of warmth over the entire body, and when any of it gets into the eyes it causes an almost painful smarting.

A notice is posted upon the walls around the swimming bath, warning those unaccustomed to the brine against diving into the bath, and it is easy to imagine that if a mouthful of the water were imbibed, the effect would be very unpleasant, if no worse.

Swimming is difficult and somewhat fatiguing, and it is only after some practice that in breast swimming the feet can be kept in the water at all. Floating is extremely easy, and indeed one can sit in the water without fear of sinking, so great is its buoyancy even in the diluted state, in which it still has a specific gravity of 1.100. Its specific gravity is indeed comparable with that of the Dead Sea, which is said to range between 1.172 and 1.227.

On coming out of the bath the patient is wrapped in a large hot towel and is directed to sit still for some minutes. If a shower has not been taken the bather soon finds himself covered with an efflorescence of salt crystals, which cling to the hair, and find resting places in the pinnae of the ears, in the nasal folds, and elsewhere.

I have not been able to obtain much information as to the absorption of sodium chloride through the skin, but Mr. Cuthbertson tells me, in answer to my inquiries on this point, that the chlorides of the urine are usually found to be slightly increased during the course.

He also mentions that he has known persons who through ignorance have taken a bath in the cold undiluted brine, to be removed from it about five minutes later in a state of collapse.

Occasionally, but rarely, some palpitation or sense of cardiac oppression is experienced after the bath.

**Therapeutical uses of the Baths.**—The curative effect of the Droitwich treatment is most strikingly exhibited in cases of so-called *muscular rheumatism*, and Mr. Cuthbertson goes so far as to describe the course as a certain cure of this affection, whilst Mr. Jones speaks equally favourably of the result obtained.

In *sciatica* also the treatment is very efficacious in most cases, but the favourable results are not quite so uniform.



In *gouty cases* the first effect is often to provoke an acute attack, and as Sir William Roberts has pointed out, this result is not uncommon when such cases are treated by means of mineral waters rich in sodium salts. Local baths or compresses are sometimes applied to the affected joints, and in the opinion of the local medical men, the Droitwich course is often attended with very favourable results.

*Osteo-arthritis* is benefited in some cases, but the results obtained are somewhat uncertain.

In the more *chronic rheumatic cases*, and where stiffness remains after an attack of acute rheumatism, the treatment is decidedly beneficial. In addition to the immersion baths, douches, needle, and vapour baths are employed in these cases.

Good results are also obtained in cases of *gonorrhœal arthritis*, and among other conditions in which favourable results are obtained from the treatment *paralysis from peripheral neuritis*, *chorea*, and a few cases of *locomotor ataxia*, some forms of *uterine disease*, and especially congestion and chronic inflammatory affections of the uterus are mentioned.

In cases of *debility* and during convalescence from acute diseases the baths have a tonic effect.

Lastly, excellent results are obtained in the removal of the *results of injuries* of various kinds.

The treatment is contra-indicated by advanced cardiac disease, and by organic disease of other kinds, and should also be avoided when there is any reason to apprehend a liability to apoplexy.

Baths supplied with Droitwich brine can also be obtained at Malvern by those who prefer the latter resort to Droitwich itself.

I am indebted to Mr. Cuthbertson and Mr. Jones for valuable assistance in the preparation of this report, and also to the late Dr. Roden and Mr. Bainbrigge.

## NANTWICH.

By ARCHIBALD E. GARROD, M.D., F.R.C.P.

THE Brine Baths of Nantwich in Cheshire, which were opened in 1883, although on a much less extensive scale than those of Droitwich, closely resemble them in character.

Nantwich, which was formerly the seat of a salt manufactory, is a picturesque old town containing a handsome cruciform church of red sandstone, and several ancient "black and white" houses.

It is situated in a well-timbered pastoral country, in the midst of one of the most renowned hunting districts in England.

Geologically it is upon the new red sandstone, which is there covered by a layer of drift clay.

**The Old Baths.**—There are now two distinct bathing establishments under the control of a single company. The original baths are situated in the centre of the town at the back of the town hall, and comprise ten private bath rooms, and a small swimming bath. There are here no dressing rooms apart from the bath rooms. The baths are constructed of teak wood, with the usual arrangement for holding the patient's body under water.

The swimming bath is heated by steam which enters the water by pipes at the side, but the brine used in the private baths is heated in an iron tank by means of a coil through which steam is caused to circulate. The brine acts upon the sides of the tank, and the ferric oxide held in suspension in the brine renders it rather thick and opaque.

In addition to the ordinary wooden baths there is a deep immersion bath lined with glazed bricks, and fitted with a douche.

Needle, douche, shower, and vapour baths are also provided.

The supply of brine is practically unlimited.

**The New Baths.**—It was found that the attractiveness of the



old baths was seriously detracted from by the want of adequate hotel accommodation for visitors, and accordingly a mansion in the outskirts of the town standing in a well-timbered park of sixty acres in extent was acquired, and was converted into an hotel, a large new wing being added to the original house. In connection with the Brine Baths Hotel a new bathing establishment was erected approached by a corridor which enables the patients to get to the baths without passing through the open air.

Here the bathing arrangements, although limited as yet, are very good, and it is proposed to add to them from time to time as required. A site is indicated for a swimming bath which will form a great and important addition to the establishment.

The new baths, eight in number, are constructed of teak wood, and two dressing rooms open into each bath room. A needle bath, vapour bath, and sitz bath, with ascending and lumbar douches, are also provided.

The method of heating is different to that in use at the old baths, a jet of steam encountering the brine in a small mixing box placed just above the bath; and consequently the brine is more transparent, and not coloured as at the other establishment.

The brine here used is brought in carts from the spring which supplies the older establishment, and is stored in large tanks, but it is probable that before long conveyance by pipes will be substituted, either from the old spring or from a private one situated in the park, which promises an ample yield.

An analysis by Dr. Frankland, F.R.S., gives the following as the composition of the Nantwich brine, which has a specific gravity of 1142.76.

Grains of Saline matter per Imperial Gallon.

Chloride of Sodium ... ..	14,697.01
Chloride of Potassium ... ..	135.28
Bromide of Potassium ... ..	1.67
Carbonate of Lime ... ..	15.49
Carbonate of Soda ... ..	6.95
Sulphate of Lime ... ..	455.99
Chloride of Magnesium ... ..	157.90
Sulphate of Soda... ..	353.09
Alumina and Peroxide of Iron ... ..	2.53
Silica ... ..	.47
Nitrate of Soda ... ..	.47
	<hr/>
	15,826.85

It will be seen that it is decidedly weaker than the Droitwich brine, as obtained from the spring, but whereas at Droitwich the natural brine is too concentrated for use, and is diluted with an equal quantity of hot water, at Nantwich the method of heating causes no appreciable dilution, with the result that, as a matter of fact, the brine baths as given at the latter place are somewhat more concentrated than those at Droitwich.

The baths are given at temperatures varying from 98°—104° Fahr. and for a period of a quarter to half an hour. The brine is diluted by the addition of water if necessary.

On coming out of the bath the patient is wrapped in a towel and lies on a couch until dry, when the salt is rubbed off, and the patient dresses, goes home, and rests for a few hours.

**Therapeutical Uses of the Baths.**—What was said as to the therapeutic indications for the Droitwich baths may be taken as applying to brine baths in general.

At Nantwich *lumbago* and other forms of *muscular rheumatism* are much relieved. *Sciatica* is in some cases cured very rapidly, and Dr. Munro thinks that the most conspicuous successes are obtained in such cases; but Dr. Lapage, whilst admitting the occurrence of such "brilliant exceptions," speaks with less confidence of the effects of the baths in the treatment of this obstinate affection.

The treatment is very effectual in removing the *residual pain* and stiffness left by acute rheumatism, but should not be employed in cases with at all serious valvular lesions. Gouty patients, unless recently recovered from an attack, are apt to develop acute articular mischief under treatment, and Dr. Lapage is of opinion that such patients should not be submitted to it. The same applies to those suffering from affections of the brain or liver.

The establishments are open all the year round, but the most favourable season for the treatment is from May to September inclusive. The climate of Nantwich is said to be equable, mild and dry. Heavy snowstorms are rare, and fogs are infrequent. In 1877 the rainfall, measured by Surgeon-Major Hale, V.C., was 20·34 inches, and rain fell upon 146 days in all.

We are indebted to Drs. Munro and Lapage for the above information as to the therapeutic uses of the Nantwich brine.



## THE BRINE BATHS AT STAFFORD.

SOME sixteen years ago a boring was made by the Corporation of Stafford at the north end of the town, in search of a water supply. This boring, which was continued to a depth of 770 feet, traversed not only the red marls, but also two beds of rock salt respectively 46 and 12 feet in thickness. The brine well thus established was in 1892 utilised by the Corporation for baths.

An analysis made by Mr. E. W. T. Jones, F.I.C., gives the following as the composition of the brine :—

	Grains per gallon.
Sodium Chloride ... ..	18393·9
Magnesium Chloride ... ..	266·7
Magnesium Sulphate ... ..	23·1
Potassium Sulphate ... ..	63·0
Calcium Sulphate ... ..	338·1
Total Saline matter ... ..	<u>19084·8</u>
Specific gravity at 60° F. 1176·02.	

Like the Droitwich brine (sp. gr. 1195·) that of Stafford is too strong to be used without dilution, and is accordingly heated by admixture with hot water.

The bathing arrangements comprise :—

- (1) A brine swimming bath 35 ft. × 25 ft.
- (2) Brine slipper baths.
- (3) Needle and Turkish baths, and fresh water swimming and slipper baths.

The brine baths are given hot (96°—104° F.), and tepid (85°—95° F.).

We are indebted to Dr. Blumer, M.O.H. for Stafford, for the above information.

## SALTBURN-BY-THE-SEA.

AT Saltburn, in Yorkshire, a bathing establishment has recently been erected in which, in addition to sea-water swimming baths, douches of various kinds, electric and vapour baths, brine baths are also provided.

The brine used is conveyed by rail, in specially constructed tanks, from the brine wells at Middlesbrough.

The following analysis of the Middlesbrough brine was made by Messrs. Pattison and Stead of that town in 1893.

	per cent.	reduced to grains per imperial gallon (70,000 gra.).
Sodium Chloride ... ..	25·365	17755·5
Sodium Sulphate... ..	0·066	46·2
Calcium Sulphate ... ..	0·402	281·4
Magnesium Sulphate ... ..	0·048	33·6
Calcium Carbonate ... ..	0·029	20·3
Water ... ..	74·090	51863·0
	100·000	70000·0

Specific gravity, 1200·88.

Our thanks are due to Mr. Brameld for the above information.



## WOODHALL SPA.

By DOBNEY BARNES, M.D., F.R.C.P.

IN studying the hygienic and therapeutical characters of a locality the rational course is, in the first place, to examine its common or general features, and, secondly, its special properties.

Four fundamental conditions have to be taken into account in studying the health relations of any locality. This rule applies equally to the study of localities for which some special virtue is claimed. That is, this special virtue must be studied in addition to, and in connection with, the common or general features.

The first or common conditions of a locality, studied from a health point of view are: (1) the soil; (2) the water; (3) the air; (4) the food.

It may be laid down as a general law that good soil and good water are primary conditions of good air. Here, then, are three first factors which go to make health. These three will further generally produce good food. An important accessory to these fundamental conditions is opportunity for healthy out-door exercise, and for the exercise of mental and social faculties.

It is but a truism to say that where these factors are found in due proportion, ordinary persons of good constitution will find a suitable locality for the preservation of health. We might go further and say that a locality so endowed will enable many persons suffering from broken health, and even marked disease, to recuperate and recover. Some of the localities referred to this Committee possess the stated fundamental conditions of health in a high degree, and no special virtue is sought in them. Amongst the most remarkable places of this kind is Malvern.

It may be fairly doubted whether any special virtue can act well unless it be added to these four elementary requisites. So we must in all cases start from this basis.

Applying this principle to the case of Woodhall Spa, for which special virtues, based mainly on the presence of bromine and iodine, are claimed, we have first to examine the soil. It is

especially necessary in this case to examine the ground in its depth and on the surface.

The Woodhall Spa Spring is on the border of the fens, about five miles south-west of Horncastle. The country is flat; its elevation not much above sea-level. The soil is sand with iron-stone, and of great depth. In 1828 Mr. John Parkinson, searching for coal, sank a shaft to the depth of 1,020 feet. No coal was found. It was thought that the thick mass of the combined oölitic clays, the Oxford and the Kimmeridge, was not bottomed. At 520 feet a mineral spring was struck, rich in iodine and bromine.

White, in his general account of the geology of Lincolnshire, says the "fen-gravels are the oldest of the true fen-deposits, and can be traced more or less regularly forming a surface-fringe all round the fen-lands. They are also met with in most deep sinkings. On the north we trace gravel from Stickford to Tattershall and Woodhall Spa. The gravels are from 10 to 40 feet thick, and are of marine origin. No shells are found in them."

Although the district may be broadly described as a vast fen-flat intersected by canals, it is contended that Woodhall Spa is singularly free from the insalubrious conditions commonly attributed to fens. Thus, it is said, peat is no longer forming. The climate is now too dry. The drainage is too good. The district is flat. It is fair to cite the remark of Dr. Williams that "many invalids cannot bear the exalting nature of mountain air, whilst others are depressed and made ill by residence at the sea-coast."

We may now examine the air, depending as it does for its qualities greatly upon the soil, and from the currents brought from inland and from the sea. The extensive flat, of which Woodhall forms a part, allows free passage of air from all quarters. It is under the influence of sea-breezes, although not so near that the air is liable to be overcharged with moisture from this source. Residents believe it to be charged with ozone, and have told me that going into the grounds when the water is being pumped up they could smell the iodine. I am unable to verify or to contradict this belief. But I may call attention to the fact that many persons loiter on a sandy beach when the tide is out, imagining that they are inhaling ozone, whereas they are inhaling the pro-



ducts of decomposing sea-weeds and animal matter. There is, however, one undoubted tribute to the healthy quality of the air, that is the growth of Scotch firs. The ground upon which they grow is generally dry. The balmy emanations from pine-trees are pleasant and healthy. They do not give off so much moisture as most other trees. Their leaves or needles do not decompose like the leaves of the beech, elm, poplar, horse-chestnut, and other trees, which falling in autumn keep the ground damp; and, rotting, give off offensive and unwholesome smells. Indirectly pines keep the soil healthy by excluding decomposing vegetable matter. As a consequence, the soil being thus free from percolation of foul matter, the air it gives out into the atmosphere is likely to be pure; and, further, the rain water falling upon it will also be pure.

In connection with this point it is interesting to note the observation of Mr. Latham, C. E., who, in a paper<sup>1</sup> on the relation of ground-water to disease, says that "diseases of a certain type are most rife during that period when the ground is filling up with water and expelling the ground air; and are least rife when the current of air is inwards, instead of outwards from the ground." Hence the importance of the absence of conditions fouling the air which is carried into the ground.

There may be cited in illustration of this argument of Mr. Latham that ague is practically unknown in the district. Dr. C. J. Williams, the medical superintendent, whose frankness and courtesy in giving me the information I sought from him I most cordially acknowledge, emphatically repudiates "the idea that Lincolnshire is the cradle of ague." He says "not a single case of ague has occurred in Woodhall or within a radius of many miles for the last ten years. Being built upon moorland with a subsoil of sand, and having according to Mr. S. M. Miller a less rainfall than any other part of England, the sporadic occurrence of ague is an impossibility."

In reference to this statement as to the small rainfall, it ought to be noted that no systematic meteorological observations are made or recorded in this place. All health resorts ought to be complete meteorological stations.

We may now examine the special characters of the Woodhal Spa water.

<sup>1</sup> Royal Meteorological Society.

It is convenient in this place to state that the water used for ordinary purposes is brought from the Wolds, fifteen miles off. It seems to be very pure. It is softer than the water supplied to London.

**The Woodhall Spa Water Proper.**—Mr. Latham examined the well. He found it to yield 1,100 gallons per hour. After three weeks' cessation of pumping, the water stood at 122 feet below the surface, and *much below the level of the sea*. He also inferred, judging from the temperature of the water, 56° F. at a depth of 140 feet from the surface, that there is every probability that the water comes from the depth indicated, namely about 500 feet. "It is not at all unlikely," adds Mr. Latham, "that the spring has a direct connection with the sea."

The water is drawn up, and discharged into tanks which have a storage capacity of 155,000 gallons. Attached to these tanks are evaporating pans for preparing the *mutterlauge*, and the bottling stores.

In the tanks a certain quantity of the water is stored for daily use. It would appear that it is difficult to obtain continuously day by day enough water to meet the current demand, and the question suggests itself, whether, during this storage, especially in warm weather, some important changes may not take place in its constitution and properties. Gases may escape and certain reactions may occur. Any one who has observed the difference between the dead sea-water kept even for a short time in a swimming bath, and the exhilarating breath of the living wave, will appreciate this point. I have been told that the water preserved in the tanks at Woodhall Spa is sometimes offensive.

Those who are interested in the Woodhall Spa cite the analysis of Professor Wanklyn made in December, 1886, which is here appended:

	Grains per gallon.	Reduced to parts per 100,000.
Chloride of Sodium ... ..	1,330·00	1,900·00
Chloride of Calcium ... ..	111·00	158·56
Chloride of Magnesium ... ..	91·20	130·28
Carbonate of Soda ... ..	10·00	14·28
Sulphate of Soda... ..	·30	·43
Nitrate of Soda ... ..	·55	·78
Free Iodine ... ..	·20	·28
Iodine (as Iodates) ... ..	·20	·28
Iodine (as Iodides) ... ..	·40	·56
Bromine (as Bromides) ... ..	3·40	4·85
Peroxide of Iron ... ..	traces	traces



He found the sp. gr. to be 1.01625 at 60° F. Professor Frankland, who made an analysis in May, 1891, for this Committee, found the sp. gr. 1.0165, that is, a little higher. Professor Frankland's analysis is appended to this report. I will therefore simply indicate some of the more important conclusions. We may dispose in the first place of the iodine and bromine, elements which form the basis of the special claim. Wanklyn found 0.2 grains of free iodine in a gallon, and observes that the brownish tint of the water is due to *free iodine*. It has been reported to me by a patient who for several seasons was under treatment at the Spa that, four years ago, samples of the water kept in corked bottles stained the cork blue; but that in 1890-1 it had lost this property. Frankland found the water in 1891, tested soon after collection, contained neither free iodine nor arsenic. When drawn from the well it was very turbid, the deposited reddish matter consisting almost entirely of hydrated peroxide of iron.

Upon this point it may be observed that the presence of free iodine may be occasional, and at times due to decomposition of iodides after being drawn.

We have next to consider the *iodine in combination*. In 100,000 parts Wanklyn found, in addition to 0.28 free iodine, 0.84 part in combination as iodates and iodides (total iodine 1.12 part), and 4.85 parts of bromine as bromides. Frankland found 0.57 part of iodine, in combination as iodide of potassium, and 4.71 of bromine as bromides. The difference is not very great. But the question arises whether the supply of iodides and bromides is constant and uniform. Is it derived from the percolation of spring water through strata containing iodine and bromine in combination, or is it renewed or kept up by percolation from the sea? Unless it is renewed from the perennial source of the sea, may not the supply become exhausted?

But we are not to assume that the virtues claimed for the Spa are due entirely to iodine and bromine. We must examine therefore *the other constituents*. Wanklyn found in 100,000 grains nearly 2,200 grains of the following salts: chloride of sodium, chloride of calcium, chloride of magnesium, and carbonate of soda. He also found traces of carbonate of ammonia. In 1,000,000 he found only 6° of organic matter. He dwells upon the very small propor-

tion of sulphates, namely, less than four grains of sulphate of soda in 100,000. He contends that this guarantees that no impurity has found its way into the water.

The above results do not quite agree with those more recently obtained by Frankland. Thus Frankland found, in May 1891, forty grains more solid residue in 100,000 of the water than did Wanklyn. Instead of 1,900 grains of chloride of sodium found by Wanklyn, Frankland found 1,950; and he found a notable quantity of sulphate of lime, namely, 11.17 grains in 100,000.

I will not dwell upon the special action of other than the bromides and iodides. It is indeed difficult, if not impossible, to analyse the several constituents of the water so as to assign to each its particular function. But the action of bromine and iodine admit of fairly precise estimation. Iodine especially is a remedy which is eminently diffusible through the system. It enters readily by the skin and by the mucous membranes; it permeates every tissue, working with special energy in changing and promoting the absorption of morbid neoplasms. It is one of the most striking examples of the force of remedies introduced in minute quantities continuously over a prolonged period, and so acting directly and continuously upon the structure and functions of every part of the organism. The steady use of bromo-iodic waters will thus often effect more benefit than these remedies administered in any other form. The waters can be usefully introduced in three ways: (1) by drinking; (2) by the skin, by baths, perhaps aided by massage; (3) by injections, vaginal and uterine, or rectal; and probably to some extent by inhalation.

**The Application of the Water.**—The baths are used in three forms: (*a*) the hot bath at 101° F.; (*b*) tepid at 95°; (*c*) the vapour at 110° to 130°. Dr. C. J. Williams says it has been a debated point as to whether water is ever absorbed by the skin; but he asserts that the active ingredients of the Woodhall water enter the body through the skin, and produce their action by this medium. I have no doubt upon this point whatever. I have witnessed experiments with iodine, tartar emetic, and other agents soluble in water and sea-water, which proved entry by the skin. But, to insure this entry, what one may call the tide of osmosis must be turned inwards by the fasting condition of the body, entailing diminution in the amount of circulating fluids. Hence to obtain



the most efficient action by skin-absorption, the bath should be taken after a comparative fast, and not soon after meals. A little gentle exercise is a good preparation. In a warm bath some of the vapour is usually, not necessarily, inhaled. The entry by injections, vaginal and uterine, is a matter of precise and frequent observation. It is a matter of clear experience to find iodine emitted by the skin and saliva after introduction by uterine injections.

The waters are also utilised in sitz-baths. Leg, arm, and hand baths are also used, the water being applied in the form of vapour.

Douches of all kinds are used, including the massage-douche as performed at Aix-les-Bains. Nasal douches and spray-producers are also used where it is desired to act locally.

**Therapeutical Uses of the Water.**—Dr. C. J. Williams particularly specifies the following morbid conditions amongst those for which residence at Woodhall and the use of the waters are specially indicated :—

*Rheumatism and gout*, especially those cases known as *chronic rheumatic arthritis*; and those in which thickening occurs around the joints. Such cases recover in a rapid and striking manner. That such cases should yield to the saturation of the system with bromine and iodine is consistent with our knowledge of the pathology and therapeutical history of these affections.

He mentions catarrhal states of the mucous membranes as *nasal catarrh*, *pharyngitis*, *laryngitis*, *bronchitis*, *cystitis*, as being rapidly and permanently benefited. *Leucorrhœa* (uterine and vaginal) disappears quickly, he says. *Biliousness* or functional disorders of the liver are also suitable for Woodhall.

*Skin diseases*, *scrofula*, *syphilis*, disorders specially suited for treatment by iodine, are amongst those in which the use of the water is most vaunted.

Dr. Williams particularly insists upon the value of the water in *fibroid tumours of the uterus*. It is upon this point that I am able to speak with most confidence. Nothing is clearer to my mind as the result of long observation of the use of iodine in various ways, than its influence in promoting diminution, even resolution, of hyperplasia of the uterus. I have seen like results in cases of inflammatory deposits in the pelvis. This experience induced me to send some cases to Woodhall; and I am bound to

say that a marked improvement was noted. I am not able to say so much of true fibroma or myomatous tumours.

Without venturing to offer an unqualified confirmation of the statements and opinions of Dr. Williams as to the value of the Woodhall treatment in the diseases which he specifies, I can have no hesitation in expressing my belief that the Woodhall water cure is not less efficacious than any similar water-cure elsewhere; and that its history and actual merits call for further practical investigation.

One general consideration forces itself upon the mind when discussing all therapeutical questions, and perhaps more particularly the action of mineral water cures. The inquiry cannot be narrowed to the action of the water simply. The so-called cures may be the result of other forces than those of the special waters. In many cases imagination goes a long way. In not a few, the disease supposed to be cured did not exist. Here as elsewhere credit is often given to one doubtful factor where others more real have been at work.

At the request of the Committee a fresh analysis of the water of Woodhall Spa was made by Prof. Frankland, F.R.S., and his report is herewith appended:—

“ August 17th, 1891.

“ GENTLEMEN,

“ Herewith I send you the results of analysis of the water of Woodhall Spa.

“ The water was collected on the 22nd of May last. It was very turbid when drawn from the well, but became clear on standing for about ten days, the deposited reddish matter consisting almost entirely of hydrated peroxide of iron. The sp. gr. of the clear water at 50° F., was 1·0165. The water tested soon after collection contained neither free iodine nor arsenic.

“ 100,000 parts of the clear water left, on evaporation and drying at 340° F., a solid residue of 2262·4 parts, from which the following constituents were obtained:—

	Parts,
Soda (ONa <sub>2</sub> ) ... ..	1037·0
Potash (OK <sub>2</sub> )... ..	1·06
Lime (as Carbonate) ... ..	8·59
Total Lime (CaO)... ..	77·70
Magnesia (as Carbonate) ... ..	1·61
Total Magnesia (MgO)... ..	49·94

P P 2



	Parts.
Alumina and Peroxide of Iron ( $\text{Al}_2\text{O}_3$ & $\text{Fe}_2\text{O}_3$ ) ...	29
Ammonia ( $\text{NH}_3$ ) ... ..	94
Organic Carbon ... ..	064
Organic Nitrogen ... ..	078
Nitrogen, as Nitrates or Nitrites ... ..	0 00
Silica ( $\text{SiO}_2$ ) ... ..	85
Sulphuric Anhydride ( $\text{SO}_3$ ) ... ..	6 57
Chlorine ... ..	1351 38
Bromine ... ..	4 71
Iodine ... ..	57

"These constituents probably exist in the water in the form of the following compounds:—

	Parts.
Carbonate of Lime ( $\text{CaCO}_3$ ) ... ..	15 34
Sulphate of Lime ( $\text{CaSO}_4$ ) ... ..	11 17
Chloride of Calcium ( $\text{CaCl}_2$ ) ... ..	127 87
Carbonate of Magnesia ( $\text{MgCO}_3$ ) ... ..	3 38
Chloride of Magnesium ( $\text{MgCl}_2$ ) ... ..	114 79
Chloride of Sodium ( $\text{NaCl}$ ) ... ..	1950 75
Bromide of Sodium ( $\text{NaBr}$ ) ... ..	4 22
Bromide of Potassium ( $\text{KBr}$ ) ... ..	2 13
Iodide of Potassium ( $\text{KI}$ ) ... ..	75
Silicate of Soda ( $\text{Na}_2\text{SiO}_3$ ) ... ..	1 72

"One hundred thousand parts of the water deposited on standing 0·99 parts (dried at  $212^\circ\text{F}$ .) of suspended matter, consisting chiefly of peroxide of iron. On ignition this suspended matter lost 0·12 part."

"I am, gentlemen,

"Your obedient servant,

"E. FRANKLAND."

## ASHBY-DE-LA-ZOUCH.

ASHBY-DE-LA-ZOUCH, in Leicestershire, is a town of about 5,000 inhabitants, situated at an elevation of 400 feet above the sea level. The mineral water of Ashby was discovered in 1805, at a depth of about 700 feet, during the working of the Moira coalfields. It is a saline water of moderate strength, the principal ingredient of which is sodium chloride, the amount of which salt present is nearly equal to that contained in sea water. It also contains a considerable quantity of iron in the form of carbonate, and even after dilution contains sufficient iron to be useful as a ferruginous tonic.

An analysis by Dr. B. H. Paul, F.C.S., F.I.C., made in 1888, gives the following as its composition :—

	Grains per gallon.
Chloride of Sodium ... ..	1312.23
Chloride of Potassium ... ..	8.22
Sulphate of Lime ... ..	175.69
Sulphate of Alumina ... ..	1.59
Chloride of Calcium ... ..	156.22
Chloride of Magnesium ... ..	116.99
Bromide of Magnesium ... ..	3.89
Carbonate of Lime ... ..	4.62
Carbonate of Iron... ..	6.09
Carbonate of Manganese ... ..	2.52
Silica ... ..	0.56
Total solid contents ... ..	<u>1788.62</u>

The dissolved gases amount to 21.96 cubic inches per gallon consisting of

Carbon Dioxide ... ..	19.72 inches.
Nitrogen ... ..	2.24 „
	<u>21.96</u>

Constant temperature at spring, 62° F.



The bathing establishment, a handsome building in the Grecian style, stands in its own grounds, which are well laid out and provide opportunities for archery, tennis and bowling.

The baths have recently undergone considerable alterations and improvements. Each wing of the building contains six bath-rooms with separate dressing rooms and arrangements for shower and needle baths and douches. The building is heated throughout by means of steam.

The baths are given at all temperatures from the natural temperature of 62° to as high as 110° F.

The temperature of the water was formerly raised by the addition of ordinary hot water, but the provision of means of heating by steam dispenses with the dilution so caused.

For the above information regarding the bathing arrangements at Ashby we are indebted to Dr. Charles R. Williams, consulting physician to the baths company, and medical officer of health.

Dr. Williams further mentions the following morbid conditions as those which receive most benefit from the treatment:—

1. *Gout* in its various forms.
2. *Muscular rheumatism, sciatica, and chronic joint affections of rheumatic origin.*
3. *Osteo-arthritis.*
4. *Scrofula.*
5. *Some chronic skin diseases, such as eczema, psoriasis, acne, &c., are benefited by combined internal and external use of the water.*
6. *Debility and neuralgia* of various kinds; the baths being in such cases also aided by the internal use of the water as a ferruginous tonic.

## LEAMINGTON.

By ARCHIBALD E. GARROD, M.D., F.R.C.P.

THAT a mineral water rises to the surface at Leamington has been known for at least three centuries. The fact was mentioned by Camden in his *Britannica*, which was published in the year 1586, and an analysis of the water was made by Dr. Guidot of Bath as early as 1688. This original spring is still in existence in Bath Street, and is enclosed in a small stone well-house, which is open to the public. It was not, however, until the end of the eighteenth century that baths were erected, which were supplied by a second spring discovered in 1784. Many other springs were subsequently opened up.

In the earlier years of the present century the Leamington waters enjoyed great repute, but this period of prosperity was followed by one of comparative neglect, probably due in part to the greater facilities for travel offered by the then newly constructed railways.

Recently the corporation of the town has spared no pains in developing the mineral water resources of the place, and a handsome new set of baths was opened in the year 1887. Since that date this spa has entered upon a period of returning prosperity.

The town of Leamington is situated upon the river Leam, a tributary of the Warwickshire Avon, and is in close proximity to the more ancient but much smaller town of Warwick. The town itself is well built, and contains a large resident population drawn thither by other attractions than the mineral springs, which occupy only a comparatively small place in the life of the town.

The immediate neighbourhood abounds in places of interest, historical and otherwise, Coventry, Kenilworth and Stratford-on-Avon lying within easy reach.

**The Mineral Waters.**—The pump-room and bathing establishment are situated in the lower part of the town, on the right bank of the Leam, and are supplied by a spring which was formerly



known as Robbin's Well. Of the eleven mineral springs mentioned by Loudoun in 1831 only four are at present in actual use, and only that mentioned above is employed for the supply of baths.

The saline waters, which are not thermal, have their origin in saliferous marls which form part of the lower Keuper beds of the new red sandstone, upon which formation Leamington is situated. The supply is practically unlimited, and a considerable quantity of water daily runs away into the river Leam. In the lower parts of the town, and especially on the left bank of the river, any well which may be bored will, as a rule, furnish a supply of mineral water, and indeed many such wells lie unused in the yards of the houses.

The following analyses show the constitution of the waters of the several springs.

Analyses by Professor J. C. Brazier, F.I.C. 1885 (reduced to grains per gallon).<sup>1</sup>

	Pump Room. Well No. 1.	Aylesford Well.	Public Fount.
Sodium ... ..	266·72	249·04	261·36
Magnesium ... ..	12·88	13·12	12·24
Calcium ... ..	48·64	41·36	41·44
Chlorine ... ..	414·64	333·20	360·96
Sulphuric Acid ... ..	164·24	213·12	205·92
Carbonate of Iron ... ..	0·64	0·40	8·08
Carbonate of Calcium ... ..	6·24	3·12	5·36
Carbonate of Magnesium ... ..	0·32	1·20	0·24
Silica... ..	0·08	trace	...
Combined as follows :—	914·40	854·56	895·60
Chloride of Sodium... ..	678·40	549·04	594·80
Sulphate of Sodium ... ..	...	102·56	85·04
Sulphate of Calcium ... ..	165·28	140·64	140·88
Carbonate of Calcium ... ..	6·24	3·12	5·36
Chloride of Magnesium ... ..	3·92	...	...
Sulphate of Magnesium ... ..	59·52	57·60	61·20
Carbonate of Magnesium ... ..	0·32	1·20	0·24
Carbonate of Iron ... ..	0·64	0·40	8·08
Silica ... ..	0·08	trace	...
	914·40	854·56	895·60
Specific gravity.....	1·011	1·009	1·0108

<sup>1</sup> These analyses are taken from Dr. F. W. Smith's book on *The Saline Waters of Leamington*.

A more recent analysis by Dr. Bostock Hill, F.I.C. (1890), of the spring now used for the supply of the baths and pump-room is as follows:—

	Grains per gallon.	} in the following combinations:—
Sodium ... ..	275·04	
Magnesium ... ..	17·84	
Calcium ... ..	55·76	
Chlorine ... ..	424·80	
Sulphuric Acid... ..	202·40	
Oxide of Iron ... ..	1·12	
Silica ... ..	1·04	
	<hr/> 978·00	
		Chloride of Sodium.
		" " Magnesium.
		" " Calcium.
		Sulphate of Sodium.
		" " Magnesium.
		" " Calcium.
		Carbonate of Calcium.
		" " Iron.

The chief gas is carbon dioxide in small quantities. Traces of bromine, iodine, ammonia, nitric acid, potassium and lithium have been found.

Some differences of opinion exist as to the grouping of the various constituents, and especially as to the presence or absence of calcium chloride. It will be noticed that the water of the Public Fount is much richer in iron than that of the other wells.

Among Continental mineral waters, the Leamington springs may be compared with those of Homburg, Kissingen, Soden, Salins-Mouliers, and Wiesbaden, but among these only the waters of Salins-Mouliers and Kissingen contain anything like the same amount of magnesium sulphate.

The specific gravity of the water is 1·011049, and its alkalinity, expressed as calcium carbonate, is equivalent to ·75 grains per pint.

**The Pump-room and Baths.**—The pump-room stands in its own grounds, which are well laid out, and are only separated from the adjacent Jephson Gardens by the high-road. Leamington must therefore be looked upon as highly favoured among English spas in the possession of an excellent Kurgarten. Indeed, on a bright morning, when the band is playing, and the pump-room gardens are well filled with visitors, the place has much the appearance of a Continental spa.

The water is supplied for drinking purposes in the large pump-room, which has a length of 104 feet and a breadth of 30 feet, and from this room the adjoining bathing establishment can be approached. The waters are employed both internally and externally. Internally they have an aperient action when administered in doses of a pint or so, and a diuretic action in smaller doses. The patient is advised to rise early, and to take two ten-ounce doses of



the heated water, with an interval of half an hour between the ~~men~~. The interval is spent in walking in the neighbouring garde ~~ns~~ or in the large pump-room.

The water is also supplied in bottles in a concentrated fo ~~m~~ or aerated.

The bathing establishment is not on a very large scale, *but* the baths are mostly modern, and are well appointed.

The immersion baths are lined with tiles, and are provided with brass rails for the patients to raise themselves by. Each bath opens out of a comfortable dressing room, provided with a couch. Arrangements are also provided by which crippled patients can be lowered into the bath in a chair.

These immersion baths, of which there are about a dozen, have a depth of about four feet. They are given at different temperatures, usually 99 or 100°.

Reclining baths are also provided for patients for whom the immersion baths are not suitable.

The douches are administered in douche pits, into each of which two dressing rooms open, and here there are arrangements for the Aix-les-Bains douche-massage treatment, mixing-balls such as are used at Aix affording the means of regulating the temperature of the douche.

Needle baths and special douches are also provided, a lumbago bath with a needle spray for the back, ascending douche, needle baths and douches for the eye, ear and throat.

In addition to the more expensive baths of the first, second, and third class, cheap baths are provided for the poor, either free of charge or at a cost of a penny.

The heating is done without dilution by means of copper coils, which lie in a tank surrounded by the mineral water. Through these coils steam is driven, and the loss of heat is diminished by a casing of composition, in which the tank is enclosed. From this tank the water which is employed in the baths is drawn, and is mixed with more or less cold saline water according to the temperature required.

The bathing establishment contains in addition to the mineral baths large swimming baths which are filled with fresh water.

The men's swimming bath has dimensions of 100 × 40 feet and pth of three to seven feet. It contains 125,000 gallons of water.

Again, sulphur, pine, and other baths are given, the special ingredient being usually mixed with mineral water.

Lastly, there is an excellent Turkish bath included in the establishment.

In addition to the special treatment the patients are placed under a strict *régime* similar to that enforced at many bath places on the Continent, and which is of special service in the class of cases here treated.

Massage, wet and dry packing, and electricity are also employed.

Internal remedies are occasionally given as adjuncts to the treatment, such as iron in anæmic cases, and a purgative is usually administered at the commencement of the course.

The baths are open all the year round, but from April to October is considered the most favourable season.

The climate of Leamington is not subject to great extremes. The annual rainfall is 30·2 inches, and the average number of rainy days was 176 during the ten years from 1874–1883 inclusive. The mean temperature for ten years is given by Dr. Smith as 48°.

For the following information as to the therapeutical uses of the waters I am particularly indebted to Drs. Eardley Wilmot, Thursfield, F. W. Smith and Haynes.

**Therapeutical Uses of the Waters.**—The cases in which, above all others, the Leamington course is valuable are those in which there is *congestion and enlargement of the liver*, brought about by residence in hot climates. In such cases the internal use of the waters is chiefly insisted upon, and this treatment, aided by regular hours, exercise, and a strict dietary, frequently produces remarkably good effects. A similar course of treatment is very useful for those who are troubled with digestive and congestive troubles, resulting from a too liberal use of alcoholic drinks, or from a too free indulgence in the pleasures of the table. Also in cases of simple *obesity*, with or without piles. (It should be mentioned that one of my informants is strongly of opinion that the presence of piles should be regarded as a contra-indication to the course.)

In cases of *chronic gout* much benefit is derived from the internal and external use of the waters combined, but more acute cases are usually regarded as unsuitable for the Leamington treatment. An attack of gout may follow a too prolonged course.

The waters are used both internally and externally in the



treatment of *rheumatoid arthritis*, but whereas some of the local medical men speak of favourable results, others hold that but little benefit is obtained.

In *chronic rheumatic conditions* the waters are used both internally and externally with good effect, but the opinions are not unanimous as to the value of the treatment in cases of *muscular rheumatism* and *chronic gonorrhœal arthritis*.

In the chronic stages of *sciatica* good results are obtained by the combined internal and external treatment, and *sciatica* of gouty origin is especially benefited.

All agree as to the value of the course in very *chronic scrofulous cases*, with glandular enlargements. In such cases the internal use of the water is relied on, and iron is sometimes given as an adjunct. Patients with *enlarged tonsils* are also stated to receive benefit. In cases of *chlorosis* the internal use of the water is found very efficacious in combating the constipation which is so constant an accompaniment of that disease, but in such cases iron is given at the same time, the minute quantity of iron contained in the water being quite insufficient to effect a cure.

In some chronic forms of *skin disease*, and especially in gouty eczema and psoriasis, the internal use of the water is attended with very favourable results.

Dr. Thursfield has had good results in cases of *glycosuria* or *diabetes* developed in connection with the gouty state.

Where there is a tendency to *uric acid gravel*, and in *gouty albuminuria* good results are obtained.

In cases of *uterine and pelvic congestion*, of *amenorrhœa*, and at the period of the *climacteric*, the combined external and internal use of the waters is often of service. In such cases local douches are employed.

Lastly, the water may be used externally in combination with massage in the treatment of *sprains*, *ankyloses*, *fibrous adhesions in joints* or other results of *injury*. In such cases the local douche is largely employed.

The following are mentioned as conditions contra-indicating the treatment. All acute diseases, great debility, wasting diseases, such as *phthisis*, *diabetes*, or cancer acute gastritis, gastric ulcer, conditions accompanied with vomiting or diarrhœa, valvular disease of the heart, *angina*, *syncope*, *neurasthenia* and *pregnancy*.

## CHELTENHAM.

By ARCHIBALD E. GARROD, M.D., F.R.C.P.

THE present is not by any means a favourable time for reporting upon Cheltenham as a mineral water resort.

During the latter part of the eighteenth and early years of the nineteenth century, this spa attracted visitors from far and near, enjoying a very large share of the prosperity which all such resorts in England enjoyed at the period when the Napoleonic wars closed the Continent to those in search of health and pleasure. Even in times of peace a visit to a Continental spa was a serious undertaking in those days.

As the century grew older a rapid decline of the popularity of the Cheltenham waters set in, and this decline, which has continued until quite recently, was already clearly noticeable as early as the year 1830.

There are however at the present time abundant signs that this decadence is not to be allowed to continue, and if the plans of the Town Council are successfully carried out, Cheltenham will, before many years have passed, be provided with appliances for bathing, &c., which will challenge comparison with those of any similar resort, and may justly expect to take its place once more among the chief spas of the British Isles.

Although the mineral springs were the making of Cheltenham, which at the time of their discovery in 1716 was a mere rural hamlet, the progress and prosperity of the town have continued unchecked, in spite of their decay. With its broad streets shaded by many trees, its gardens, shops, and club, it has become a favourite place of residence, and its colleges for boys and girls have made it a great educational centre. Situated in a corner of the Severn valley, Cheltenham is protected from the easterly winds by the Cotswold Hills, which form an amphitheatre around it from the north to the south-east. The town is situated upon the blue lias, whilst the Cotswolds constitute the escarpment of the oolitic strata.

In a report on the climate of Cheltenham during the years



1878-87 inclusive, Mr. Tyrer states that, in spite of the sheltered position of the town, the temperature is not higher than that of other places on the same latitude, and he combats the widely-spread impression that the climate is relaxing. The mean annual temperature for the years in question was  $47.1^{\circ}$  F., the highest monthly mean was  $61.3^{\circ}$  for July, the lowest  $36.3^{\circ}$  for January. The average number of rainy days per annum was 189, October being the wettest and March the driest month. The mean annual rainfall was 29.84 inches.

The mineral springs are numerous, coming to the surface in many parts of the town, some of them on private premises.

In some instances smaller Pump-rooms which were formerly frequented have been converted to other uses.

With few exceptions the springs have been recently acquired by the Corporation with a view to their future utilisation for drinking and bathing purposes, and the wells have been put into a thorough state of repair. The waters are at present supplied for drinking purposes at a lodge in the Montpellier Gardens, at the Pittville Pump-room, at the Cambray Spa, which is in private hands, and at a well near the new public baths.

The Montpellier and Pittville Springs were the chief centres of social activity in the palmy days of the Spa. The Montpellier Gardens are situated near the centre of the town, cover an area of eight acres, and adjoin the Montpellier Rotunda which is still used for social gatherings. It is in these gardens that it is proposed to erect the new bathing establishment, the plans of which are under consideration.

The Pittville Gardens and Pump-room are on the outskirts of the town. The Pump-room, erected in 1825, as a rival to the then flourishing Montpellier Spa, is a somewhat pretentious building in the classical style, but soon after it was built the period of decline set in. Here waters from various springs can be obtained for drinking purposes only.

The Cambray Spa is situated in the heart of the town. Here two kinds of water are dispensed, a saline and a very palatable chalybeate, and in connection with the Pump-room are Turkish and other baths.

The mineral waters, which are none of them thermal, may be classified in three groups.

1. Magnesia-saline group, represented by the Chadnor Villa and Cottage Wells, which contain in addition to sodium sulphate and chloride considerable quantities of magnesium sulphate. These aperient waters promise to prove suitable for drinking purposes in the class of cases in which benefit is derived from the Carlsbad course.

2. Soda saline waters, in which sodium chloride and sulphate are the chief ingredients. Of these, the springs known as Pittville I. II. and III. are the most important sources, and it is proposed to utilise the springs I. and III. for the supply of baths.

3. Chalybeate waters, of which the Cambray chalybeate is the chief representative.

The waters of the six chief springs which have been acquired by the Corporation have been recently analysed (in 1893) by Professor Thorpe, and the results of his analysis are appended on the following page. The constitution of the Pittville waters agrees very closely with the analysis made by Messrs. Abel and Rodney in the year 1847.

The Cambray chalybeate contains iron in the form of carbonate, and deposits a red sediment of oxide on standing. No recent analysis of this water is forthcoming, but an old analysis by Mr. F. Accum is appended.

Cambray Iron water—

Carbonate of Iron ... ..	7.05 grains per Imperial Gallon.
Chlorides of Lime and Magnesia ...	15.50    "    "    "    "
Chlorides and Sulphate of Soda ...	24.00    "    "    "    "
Carbonates of Lime and Magnesia...	8.95    "    "    "    "
Sulphate of Lime ... ..	9.00    "    "    "    "
	<hr/> 64.50 <hr/>

Specific gravity ... .. 1.0011

Carbonic Acid Gas ... .. 24 cubic inches.

In order to give any information as to the therapeutic effects of the Cheltenham waters, it would be necessary to quote the writings of older physicians who practised in the palmy days of the Spa, and this I do not propose to do. I may mention, however, that Dr. Wilson, who is an active advocate of their revival, enumerates the *various deleterious effects of residence in hot climates, dyspepsia and renal and cutaneous affections attendant upon gout, as*



the disorders in which benefit will be most likely to result from their use.

It will be seen from the above sketch that there is no lack at Cheltenham of the materials for the making of a flourishing Spa, whilst the town itself presents attractions which can vie with those of any similar resort in this country.

I am indebted to Dr. Wilson and Mr. Ward Humphreys for valuable aid in the preparation of this report.

ANALYSES OF THE PRINCIPAL CHELTENHAM SPRINGS, BY PROFESSOR T. E. THORPE, 1893.

	MAGNESIA SALINE WATERS.		SODA SALINE WATERS.			
	Chadnor Villa Well.	The Cottage Well.	Lansdowne Terrace Well.	Pittville, No. 1.	Pittville, No. 2.	Pittville, No. 3.
	Grains per gallon.	Grains per gallon.	Grains per gallon.	Grains per gallon.	Grains per gallon.	Grains per gallon.
Sodium Chloride ... ..	27·980	41·953	391·710	503·520	310·985	466·470
Sodium Bromide ... ..	0·015	...	0·001	0·339	0·106	0·388
Sodium Iodide ... ..	0·037	...	0·021	0·155	0·056	0·099
Sodium Sulphate ... ..	60·893	109·570	155·720	96·545	148·435	115·095
Sodium Silicate ... ..	1·469	1·316	1·763	1·227	1·120	2·961
Sodium Bicarbonate ... ..	...	...	...	28·973	29·498	38·967
Potassium Sulphate ... ..	4·779	4·195	9·990	4·033	2·345	4·520
Lithium Chloride ... ..	traces.	traces.	traces.	traces.	traces.	traces.
Calcium Carbonate ... ..	36·372	31·797	27·200	14·038	13·724	4·583
Calcium Sulphate ... ..	63·460	66·713	2·447	...	...	...
Calcium Phosphate ... ..	...	...	...	traces.	traces.	traces.
Magnesium Sulphate ... ..	117·659	124·370	22·667	...	...	...
Magnesium Carbonate ... ..	...	8·521	14·115	13·227	12·541	10·886
Manganous Carbonate ... ..	0·023	traces.	traces.	traces.	traces.	traces.
Ferrous Carbonate ... ..	0·038	0·028	0·021	0·212	0·134	0·056
Aluminium Phosphate ... ..	0·011	...	traces.	traces.	traces.	traces.
Ammonium Bicarbonate ... ..	...	...	...	0·085	0·071	0·078
Ammonium Nitrate ... ..	0·018	0·077	...	...	...	...
Organic Matter ... ..	traces.	traces.	traces.	traces.	traces.	traces.
	312·754	388·540	625·655	662·354	519·015	644·103
Fixed residue directly found ... ..	315·540	391·520	621·830	653·650	507·480	633·750
Fixed residue calculated ... ..	312·700	388·500	625·620	651·380	508·010	629·710
	cubic ins.	cubic ins.	cubic ins.	cubic ins.	cubic ins.	cubic ins.
Free Carbon Dioxide at 60° F. and 30 inches ... ..	17·416	44·41	31·27	29·03	20·753	35·31

## TUNBRIDGE WELLS.

By ARCHIBALD E. GARROD, M.D., F.R.C.P.

TUNBRIDGE WELLS, situated on the borders of Kent and Sussex, within thirty-five miles of London, no longer bases its claims to popularity as a place of residence, and as a health resort, upon the mineral springs around which the town originally grew up, but rather upon its situation, soil, surroundings and climatic advantages, coupled with its easy accessibility from London.

The names of the hills upon which the town is built, Mount Ephraim, Mount Sion, &c., bear witness to its popularity in the days of the Puritan ascendancy, and under the Stuart dynasty this Spa vied with Bath in attracting the Court and fashion. Even up to much later times the wells were largely visited by those who came to drink the chalybeate waters, but at the present day such patients constitute only a small proportion of the visitors.

The town is situated upon an elevated part of the Wealden area, at a height of about 420 feet above the sea-level. It stands upon the highest division of the Hastings Beds, known as the Tunbridge Wells Sand, but here and there are patches of Wealden clay, and large masses of freestone rock rise abruptly from the ground in places. The surrounding country is undulating and well wooded.

The chief mineral springs are situated at one end of the Pantiles, a paved promenade, upon one side of which are shops and a covered way for the protection of the promenaders in rainy weather.

The Pantiles still retain much of the old-world character, and can easily be peopled in imagination with the fashionable crowds of water-drinkers which thronged them in the days when the Spa enjoyed its greatest prosperity.

The water is dispensed from two basins, situated at a somewhat lower level than the pavement. At the other end of the Pantiles a reading-room is provided for visitors, and here also the water is dispensed, being brought from the wells already alluded to.



The mineral water is only used for drinking purposes, nor would there be any advantage in employing them for bathing, for although bathing forms a prominent part of the course at such Continental chalybeate Spas as Schwalbach and St. Moritz, the waters of these places are chiefly useful for this purpose on account of the large amount of free carbonic acid gas which they contain. At Tunbridge Wells there is no such excess of this gas, and only a trace of effervescence can be detected, although the amount of carbonic acid present suffices to hold the iron in solution in the form of ferrous carbonate.

The temperature of the water as it emerges is very uniform, being about 51° F. An analysis made by Dr. J. Stevenson in 1892 gives the following as its constituents, in grains per imperial gallon (70,000 grains):—

Ammonia (NH <sub>3</sub> )	0.006
Potash (K <sub>2</sub> O)	0.317
Soda (Na <sub>2</sub> O)	1.795
Lime (CaO)	1.749
Magnesia (MgO)	0.448
Ferrous Oxide (FeO)	2.798
Sulphuric Anhydride (SO <sub>3</sub> )	3.024
Chlorine (Cl)	2.492
Carbon Dioxide (CO <sub>2</sub> )	1.792
(in combination).	

which may be combined as follows:—

Chloride of Potassium	0.501
Chloride of Sodium	3.379
Chloride of Ammonium	0.019
Chloride of Magnesium	0.264
Sulphate of Magnesium	1.009
Sulphate of Calcium	3.998
Carbonate of Calcium	0.184
Ferrous Carbonate	4.508
Carbonate of Manganese	a trace.
Silica	0.602
Organic Matter	a trace.
	<hr/> 14.464

Total solid residue of one gallon experimental, 14.070.

Oxygen required to oxidise the organic matter	0.007
Yield of Albumenoid Ammonia	0.006

Specific gravity of the water, 1.0004.

Free Carbon Dioxide	20.00 cubic inches at 60° F.
Free Nitrogen	4.97 " " " "

Dr. Stevenson found that the composition of the water had not

varied materially since 1857, in which year an analysis was made by Mr. J. Thompson.

The water as it emerges is perfectly clear, and is not unpleasant to the taste.

The district around Tunbridge Wells is rich in chalybeate springs, and one of very similar composition is situated in the grounds of the "Spa," a hydropathic establishment at which baths of various kinds are administered.

For the following information as to the therapeutical uses of the water I am indebted to Dr. Pardington.

The patients treated by means of the mineral water are almost always sufferers from *anæmia* and *debility*. In cases of severe chlorosis the iron contained in the water is not in itself sufficient to effect a cure, and preparations of iron are administered as adjuncts to the course.

The length of the course is two months, and it may be entered upon at any season of the year. The ordinary dose is half or three quarters of a tumbler taken between eleven and one, accompanied by a walk upon the Pantiles, and to this a second dose of similar amount is shortly added. The water has no tendency to produce dyspepsia.

The course may be prescribed in almost any case in which the administration of iron is indicated, but cases of malarial cachexia are said not to do well.

The recovery of anæmic and weakly patients who resort to Tunbridge Wells for treatment is doubtless greatly aided by the bracing air for which the place is justly celebrated.

Although Tunbridge Wells is the only purely chalybeate Spa in Great Britain which has attracted large numbers of visitors at any time, chalybeate waters are to be found at several of the more important Spas, such as Harrogate, Buxton, Strathpeffer, and Llandrindod, and the Harrogate chalybeate springs are specially worthy of notice in this connection.

There are, moreover, numerous chalybeate springs scattered over the country, such as the Flitwick Well near Bedford, which has recently been actively developed; but of these we shall have occasion to speak in a subsequent volume in connection with the other minor Spas.



## STRATHPEFFER.

By MALCOLM MORRIS, F.R.C.S.E., AND F. PENROSE, M.D., F.R.C.P.

THE valley in which the Spa is situated is some four miles in length, sloping gently downwards from a little south of west to a little north of east.

The spa, hotels, and houses, are situated in the upper part of the valley on the southern slope.

The valley is most open to the north-east, but is sheltered by hills in every direction.

The climate, from the character of the vegetation, appears to be both mild and dry. Evergreens, such as rhododendrons, grow to a large size. The trunks of the trees are not covered with lichens, nor is there any great luxuriance of ferns and mosses, at any rate, in that part of the valley in which the various buildings are grouped.

The feel of the air, owing to the way in which the valley is surrounded by hills, is somewhat oppressive and sultry. It is certainly relaxing in the bottom of the valley.

The favourite months are from May to the end of October, during which the place is for the most part full of visitors, but it is open all the year, though in the winter and early spring it is but little visited.

The establishment consists of a two-storied building, the ground floor being occupied by the room in which the waters are distributed for drinking and by the bathrooms.

The room in which the waters are distributed is a hall surrounded by a verandah open to the north and east. The usual custom is for the patients, after being supplied with the proper quantity of the water prescribed, to pass out into the verandah

*Strathpeffer Spa: Its Climate and Waters.* By Fortescue Fox, M.D. (H. K. Lewis, 136 Gower-street, London. 1889.)

and there imbibe it slowly; the customary hours for this being 8 A.M. and 11.30 A.M.

**Baths.**—Behind the hall are suites of bathrooms, and the following descriptions of baths are provided:

**Sulphur Baths.**—The water is generally warmed directly or occasionally by the addition of one part of warmed pure rain water to two parts of sulphur water.

**Pine Baths.**—These consist of ordinary spring water, to which "Pine-extract" obtained from Germany has been added.

**Douche Baths** of ordinary water.

**Peat Baths.**—The peat is brought from the hills, and is then thoroughly churned up with warm water at any required temperature into the baths. There are also local douches and arrangements for packing and rubbing. The bathing arrangements generally are being constantly renovated to allow of the introduction of the most recent improvements.

The upper story of the building is devoted to cooling-rooms for the use of those who have just bathed.

**Internal Use.**—Undoubtedly most reliance appears to be placed on the internal administration of the waters for the treatment of disease.

The waters are of two kinds—

- (1) Sulphur (cold).
- (2) The Chalybeate.

The following analyses of the various waters are taken from the third and sixth chapters of Dr. Fortescue Fox's book on Strathpeffer Spa.

**Accommodation.**—There are two important hotels. One in connection with the establishment is situated down the valley close to the railway station. The other stands much higher up the valley, and commands much the most favourable position. There are also several smaller hotels and a considerable number of villas and lodging-houses.

Access by rail is fairly convenient. The journey from London takes about seventeen hours.

**Diseases Treated, &c.**—

By far the larger number of those who attend as patients suffer from gout or articular rheumatism. They receive benefit not



SYNOPSIS OF ANALYSIS OF THE STRATHPEFFER SULPHUR WATER.  
In Imperial Gallon.<sup>1</sup>

	Strong Well.	Old Well.	Upper Well.
<b>I. SOLIDS.</b>			
	Grains.	Grains.	Grains.
Sulphate of Lime ... ..	50·92	18·89	23·43
Carbonate of Lime ... ..	14·88	7·43	6·24
Phosphate of Lime and Magnesia ...	0·50	0·43	...
Sulphate of Magnesia... ..	31·08	...	39·18
Carbonate of Magnesia ... ..	traces	1·09	1·78
Sulphate of Soda... ..	5·86	2·47	9·87
Sulphuret of Sodium ... ..	0·53	0·78	0·12
Sulphuret of Potassium ... ..	1·30	...	0·89
Silica ... ..	2·14	0·77	3·06
Organic Matters ... ..	1·02	2·66	2·35
Sulphur in Suspension ... ..	4·07	2·47	1·84
Chlorine ... ..	traces	...	...
Chloride of Sodium ... ..	...	4·60	4·54
Potass Salts ... ..	...	traces	...
Sulphide of Iron ... ..	...	...	1·08
	112·30	41·59	94·38
<b>II. GASES.</b>			
Sulphuretted Hydrogen ... ..	4·34	1·60	1·21
The same in cubic inches ... ..	11·26	4·01	3·03
Carbonic Acid—undetermined.			

ANALYSIS OF THE CHALYBEATE WATER OF STRATHPEFFER. BY DR. STEVENSON  
MACADAM.

ANALYTICAL LABORATORY, SURGEON'S HALL, EDINBURGH,  
July 6th, 1871.

Analysis of sample of water from Saints' Well, Strathpeffer.  
One Imperial Gallon contains:—

	Grains.
Carbonate of Iron ... ..	2·46
Carbonate of Lime ... ..	3·14
Chloride of Sodium ... ..	1·17
Sulphate of Lime ... ..	1·13
Chloride of Magnesium ... ..	0·38
Carbonate of Magnesia ... ..	0·41
Phosphates ... ..	0·19
Soluble Silica ... ..	0·21
Organic Matter ... ..	0·47
Total Matter dissolved in Imperial Gallon ... ..	9·56
Hardness 7½°	
	Cubic Inches.
Total Gases dissolved in Imperial Gallon ... ..	12·68
Percentage of composition of the Gases—	
Carbonic Acid ... ..	31·98
Oxygen ... ..	20·34
Nitrogen ... ..	47·68
	<u>100·00</u>

<sup>1</sup> Equal to 160 fluid ounces; 70,000 grains in weight; and 277 cubic inches by volume.

always, however, from an isolated visit; and, in reference to gout, an acute attack may occasionally develop during, or very shortly after, a course of treatment has been undertaken.

Cases of eczema and psoriasis, especially those which seem to be associated with lithiasis and gastric disturbances, are said to receive benefit.

Cases of sciatica improve but little if at all.

Both place and treatment are very unsuitable for those suffering from asthma.

## MOFFAT.

By MALCOLM MORRIS, F.R.C.S.E.

MOFFAT is beautifully situated with delightful air. The climate is decidedly rainy.

There is a weak sulphur spring about a mile and a quarter up the valley.

There is a weak, very pleasantly tasting, chalybeate water, which is obtained from a spring some miles away. The water is of varying strength, and is brought in stone jars to the village chemist, who dispenses it.

There are two hotels in the town, and an antiquated set of baths.

There is a large so-called hydropathic establishment, in which there is a very good Turkish bath.

There is no sulphur-water treatment whatever at the hydropathic establishment.

There are several lodging-houses and villas.

**Diseases.**—Cases of slight anæmia are said to improve satisfactorily, and also of constipation, particularly in those who have been for some years in India or other tropical climates.



## LLANDRINDOD WELLS.

By FREDERICK T. ROBERTS, M.D., F.R.C.P.

**History.**—Llandrindod Wells has only come into note, at any rate in England, within a comparatively recent period. One of the mineral wells or springs in the Old Pump House has been known, however, for at least three centuries; and it is stated that part of the ancient Pump House Hotel, which a few years ago was demolished to make room for the new one, was nearly 300 years old. There is a definite record of the use of the Llandrindod waters for medicinal purposes since the year 1696, though probably almost entirely by natives of the Principality. At this period the place seems to have been commonly known as "The Wells." In 1754, Dr. Linden, who is described as "an eminent German physician, and author of several works on mineral waters," visited Llandrindod Wells, and subsequently wrote an elaborate treatise upon it, speaking very highly of its air and climate, as well as of its mineral waters. Nevertheless, owing to its situation and the difficulty of access to the place, amongst other reasons, Llandrindod Wells remained for a long time practically unknown beyond Wales, and was resorted to by comparatively few. During the present generation, however, it has developed in a remarkable degree, and has come to occupy a prominent position among the "spas" and "health-resorts" of England and Wales, being visited by large and yearly-increasing numbers of patients and others during the season. The place is now easily accessible from all parts of the kingdom, as it has a station on the London and North-Western Railway system, which connects it with a large number of important centres.

**Situation and General Characters, Geology, Climate, &c.**—Llandrindod Wells is situated in Radnorshire, a county in Mid-Wales but little known, and the most sparsely populated of all the counties of England and Wales. The entire district is purely agricultural, and there are no works or mines of any kind to contaminate the air. The place occupies the centre of an extensive broad common or plateau—Llandrindod Common—which has an altitude of over 700 feet above the sea-level. Geologically it lies upon the Llandilo flags of the Silurian system, a thick bed of shale underlying the soil for many miles around, with occasional irruptions of igneous rock masses. The shale is divided by numerous fissures, through which the mineral springs find their way to the surface, and which contain veins of iron sulphide.

Llandrindod Wells is surrounded by hills on all sides except the south-west, but these are some miles off, and comparatively low, so that it is in no degree shut in. Towards the east, however, it is well-sheltered and protected by a range of hills 2,200 feet high, known as Radnor Forest. The air, to which Llandrindod owes in no small measure its advantages as a health-resort, is decidedly bracing and exhilarating, and is undoubtedly remarkably clear and pure; it is also said to be of a mild temperature, not too keen, and celebrated for its dryness. The prevailing wind is from the south-west, which blows direct from the coast-line, without any intervening large town or populous place to contaminate the atmosphere. The common is breezy; the air cannot stagnate, and is nowhere obstructed, but, as described by Dr. Linden, "fans and refans from corner to corner, from any point whatsoever it may happen to blow." Owing to its position the rainfall in Llandrindod is stated to be comparatively small—considerably less than the average of the west of England, and much below that of Wales generally, or of the surrounding districts; while the roads and paths dry up very rapidly after rain. The average annual rainfall is about 35 inches, but it differs considerably in different years.

The growth of Llandrindod Wells during the last twenty years has been very striking, and it is still rapidly increasing. From a small village it has become a place of considerable size, a large number of houses having been built for the accommodation of visitors. It presents, however, an irregular and scattered appear-



ance, and there is little or no system in the architecture, or harmony in design, each house having apparently been erected on a strictly independent plan, and commanding whatever aspect its builder chose. The hotel-accommodation is now thoroughly satisfactory, and it is possible to obtain every comfort or even luxury which an invalid may require.

The water-supply and system of drainage are described as being in every way excellent. The water for domestic purposes comes from a series of springs on a neighbouring hill. There is a small artificial lake in the grounds of the Pump House Hotel, which is used for boating. There are many pleasant and interesting walks and drives in and around the district, as well as places for lounging or quiet retirement; while outdoor games and other forms of amusement can be indulged in by those who are inclined for such pursuits. The fashionable game of golf seems to have established itself permanently at Llandrindod Wells, and may prove an attraction, as well as a health-giving and invigorating exercise, at other times besides during the recognised season.

**Mineral Springs.—Nature and Composition of Waters.—**

The waters at Llandrindod Wells are classed as Saline, Sulphuretted, and Chalybeate. There are two centres for their supply and use—namely, the Old Pump House, which is in the grounds of, and close to the Pump House Hotel; and the Park Spa, situated near the Rock House Hotel. In the Old Pump House are the two original<sup>1</sup> saline and sulphur springs. The Park Spa has also saline and sulphur springs, which were only discovered in 1867; and in 1893 two new wells were found, which have been named respectively the Roman Spring and the Magnesium Spring. There is but one chalybeate spring, which is in the Rock Park, and, along with a fountain, was presented for the free use of the public in 1879, by the Lord of the Manor.

The following are the analyses of the several mineral springs at the Llandrindod Wells, made, except where otherwise stated, by Dr. Horace Swete, the analyst for the counties of Worcester and Radnor, assisted, in the case of those recently discovered, by Mr. Raymond Ross.

<sup>1</sup> A "new Saline spring" was supposed to have been found in connection with the Old Pump House, but subsequently this was proved to be merely a leakage or overflow from the old well, and now only the original Saline spring is used there.

## OLD SALINE SPRING, OR FFYNNONLLWYNYGOG (WELL IN THE CUCKOO'S GROVE).

Temperature of Spring, 48° F. Specific Gravity, 1004·74.

Gaseous Contents at 48° F. and 30° Bar.—

Oxygen ... ..	2·52	cubic inches per gallon.
Nitrogen ... ..	6·27	" " " "
Carbonic Acid ... ..	0·35	" " " "

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 9·14
 

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Mineral Constituents in Grains per Imperial Gallon.

Chloride of Sodium ... ..	334·24
Chloride of Potassium ... ..	2·10
Chloride of Calcium ... ..	68·43
Chloride of Magnesium ... ..	2·61
Chloride of Lithium ... ..	a strong trace.
Chloride of Thallium ... ..	a trace.
Carbonate of Calcium... ..	3·50
Carbonate of Ammonia ... ..	·23
Nitrate of Calcium ... ..	·41
Oxides of Iron and Alumina } ... ..	1·17
Phosphates of Iron and Alumina }	
Sulphate of Calcium ... ..	1·15
Bromide of Potassium ... ..	·02
Silica ... ..	1·70
Water of Combination ... ..	25·20

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 440·76
 

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## OLD SULPHURETTED SPRING.

Temperature of Spring, 48° F. Specific Gravity, 1005·14.

Gaseous Contents at 48° F., and 30° Bar.—

Oxygen ... ..	·61	cubic inches per gallon.
Nitrogen ... ..	5·77	" " " "
Carbonic Acid ... ..	1·75	" " " "
Sulphuretted Hydrogen ... ..	2·62	" " " "

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 10·75
 

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Mineral Constituents in Grains per Imperial Gallon.

Chloride of Sodium ... ..	162·80
Chloride of Potassium ... ..	a trace.
Chloride of Calcium ... ..	49·21
Chloride of Magnesium ... ..	2·61
Chloride of Lithium ... ..	a trace.
Carbonate of Calcium... ..	9·00
Nitrate of Calcium ... ..	·70
Sulphate of Calcium ... ..	·50
Sulphide of Ammonia ... ..	·21
Oxides of Iron and Alumina } ... ..	·10
Phosphates of Iron and Alumina }	
Bromide of Potassium ... ..	·20
Iodide of Potassium ... ..	a trace.
Silica ... ..	2·38
Water of Combination ... ..	21·24

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 248·95
 

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This analysis does not altogether correspond with a later one made by Prof. Wanklyn in 1889. He found that 1,000 volumes of the sulphuretted spring at the Old Pump Room contained a little more than one volume of sulphuretted hydrogen gas; and that the sp. gr. of the water at 58° F. was 1003·22. His analysis of solid ingredients in one gallon gave the following results:—

	Grains.
Carbonate of Lime ... ..	7·3
Sulphate of Lime ... ..	1·0
Chloride of Calcium ... ..	47·2
Chloride of Magnesium ... ..	5·6
Chloride of Sodium ... ..	235·9
	<hr/>
	297·0

The water likewise contained in one million parts—free ammonia, 0·80; albuminoid ammonia, 0·04. There was very little dissolved carbonic acid; and the water was absolutely devoid of dissolved oxygen.

#### SULPHURETTED SPRING AT THE PARK SPA.

Analysis by Prof. Herapath in 1867.

One gallon contained—

Sulphuretted Hydrogen Gas ... ..	4 cubic inches.
	Grains.
Chloride of Magnesium ... ..	23·72
Chloride of Calcium ... ..	4·12
Nitrate of Lime ... ..	a trace.
Chloride of Sodium ... ..	61·14
Sulphate of Magnesia... ..	6·70
Carbonate of Lime ... ..	15·92
Carbonate of Magnesia ... ..	2·00
Sulphate of Lime ... ..	4·80
Sulphate of Iron... ..	a trace.
	<hr/>
	118·40

#### CHALYBEATE SPRING.

Temperature of Spring, 47·5° F. Specific gravity, 1005·14.

Mineral Constituents in Grains per Imperial Gallon.

Chloride of Sodium ... ..	278·30
Chloride of Potassium... ..	1·21
Chloride of Calcium ... ..	64·73
Chloride of Magnesium ... ..	13·75
Chloride of Lithium ... ..	a faint trace.
Carbonate of Calcium... ..	·61
Carbonate of Iron ... ..	1·26
Carbonate of Ammonia ... ..	·14
Nitrate of Calcium ... ..	·61
Sulphate of Calcium ... ..	·71
Bromide of Potassium ... ..	a trace.
Iodide of Potassium ... ..	a trace.
Silica ... ..	1·33
Water of Combination ... ..	26·25
	<hr/>
	388·90

# THE WATERS OF LLANDRINDOD WELLS

605

## ROMAN SPRING.

Temperature of Spring, 50° F.

Dissolved Gases in Cubic Inches per Gallon.

Nitrogen ... ..	4·20
Oxygen... ..	1·20
Carbon Dioxide ... ..	·80
	<hr/>
	6·20
	<hr/>

Mineral Constituents in Grains per Gallon.

Sodium Chloride... ..	263·37
Potassium Chloride ... ..	2·50
Calcium Chloride ... ..	98·00
Magnesium Chloride ... ..	23·80
Lithium Chloride ... ..	traces.
Thallium Chloride ... ..	traces.
Oxide of Aluminium ... ..	·56
Oxide of Iron ... ..	1·4
Calcium Carbonate ... ..	1·05
Ammonium Carbonate ... ..	·30
Silica ... ..	4·28
Nitrites... ..	nil.
Nitrates ... ..	traces.
	<hr/>
	395·26
	<hr/>

## MAGNESIUM SPRING.

Temperature of Spring, 49·5° F.

Dissolved Gases in Cubic Inches per Gallon.

Sulphuretted Hydrogen ... ..	·80
Nitrogen ... ..	4·28
Oxygen... ..	·23
Carbon Dioxide ... ..	1·60
	<hr/>
	6·91
	<hr/>

Mineral Constituents in Grains per Gallon.

Sodium Chloride... ..	236·46
Potassium Chloride ... ..	1·4
Calcium Chloride ... ..	88·9
Magnesium Chloride ... ..	49·42
Lithium Chloride ... ..	traces.
Thallium Chloride ... ..	traces.
Aluminium Oxide ... ..	1·05
Iron Oxide ... ..	·7
Silica ... ..	4·14
Ammonium Carbonate ... ..	·19
Nitrites ... ..	nil.
Nitrates ... ..	traces.
	<hr/>
	380·46
	<hr/>



**Summary.**—From the analyses just given, it will be noted that all the mineral waters of Llandrindod Wells contain a large proportion of the chlorides of sodium and calcium, with very much smaller but varying amounts of chlorides of potassium and magnesium. Sulphates are either altogether absent, or are only found in very small quantities. The chief peculiarities of the springs recently discovered are the large proportion of the calcium and magnesium chlorides which they contain. The chalybeate water has a considerable amount of saline ingredients, and only a small proportion of carbonate of iron—namely, 1.26 grains in the gallon; but it has the distinct styptic taste of the metal. The sulphuretted waters, while also of a saline nature, have the unmistakable smell of sulphuretted hydrogen, and a very decided taste. Prof. Wanklyn lays special stress upon the quality of the sulphur water which he examined as a powerful reducing or de-oxidising agent when fresh, and also draws attention to the minute proportion of the albuminoid ammonia present, as a guarantee of the absence of all sewage contamination. He regards it as a strong sulphuretted water, and states that the saline constituents are not so abundant as to prevent the taking of a sufficient dose of sulphur. Mr. Bowen Davies attaches much importance to the amount of chloride of calcium which the mineral waters of Llandrindod Wells contain.

**Modes of Use—Baths, &c.**—All the waters of Llandrindod Wells are taken internally. As already intimated, there is a pump-room connected both with the Pump House Hotel and the Rock House Hotel, and each is well-adapted for its purposes. Both rooms have been recently much enlarged and improved. Well-arranged and comfortable baths are also provided in each place, for the use of the saline and sulphuretted waters. In addition to the ordinary reclining baths, which are employed at temperatures from 115° downwards, there are shower-baths, hot and cold douches, and spray-baths (the last two being most frequently used); while the sulphur waters are also employed as vapour-baths. Massage is likewise practised in suitable cases. The arrangements seem to be adequate and satisfactory for the purposes for which they are intended.

**Actions and Uses.**—Before referring to the actions and practical uses of its several mineral waters, it is important to emphasize

the fact that Llandrindod Wells is of great service as a health-resort, apart from its advantages as a spa. Its pure and invigorating atmosphere produces marked and often rapid effects for good in the case of those who are "run down" and need a change; or whose nervous system is exhausted by overwork, or by mental worry or anxiety of various kinds, especially if they reside in large towns or cities. At first a feeling of physical weariness and ennui is often produced, but this as a rule soon passes off. Phthisis is stated to be very uncommon in the district, in comparison with the average of Great Britain; and it is affirmed that "no cases are benefited more by a prolonged stay at Llandrindod Wells than this disease in a quiescent or incipient stage, but in advanced stages the stimulating atmosphere seems to be positively detrimental." No doubt the air and other factors associated with the locality materially assist the beneficial effects of the waters in a large number of cases of various kinds.

The saline waters are described as laxative, diuretic, or alterative, according to the quantity taken. Internally administered they are found to be beneficial in dyspepsia in various phases, especially the atonic form; early cirrhosis of the liver; jaundice, whether catarrhal or resulting from gall-stones or inspissated bile; hepatic and splenic hyperæmia, whether due to errors in diet or residence in tropical climates; chronic constipation; hæmorrhoids; intestinal worms; diabetes mellitus and glycosuria; obesity; the gouty diathesis, where there are no acute symptoms; and as a cure for "drink-craving," for which Llandrindod Wells has long been held in repute. A course of either saline water is said to be highly effectual in chronic constipation, either given alone, or, in some cases, in combination with the chalybeate. As regards diabetes and glycosuria, there is abundant evidence to prove the striking benefit which results in these conditions from a course of treatment at Llandrindod Wells. Many patients suffering from diabetes frequent this spa every year, on account of the improvement in their symptoms and general state which they derive from their sojourn. In some instances glycosuria is permanently got rid of by one course of treatment. It is questionable whether the benefit in these cases can be fairly attributed entirely to the waters, and probably other factors assist. In gouty subjects the saline waters are generally given in combination with one or other of the



## LLANWRTYD WELLS.

By FREDERICK T. ROBERTS, M.D., F.R.C.P.

LLANWRTYD WELLS ranks in Wales next to Llandrindod as a "spa." It is situated in Breconshire, on the line of railway between Llandovery and Llandrindod. The village is about half a mile from the station, and some distance beyond is the principal hotel, Dolecoed House, near which are the springs. They occupy a position at the opening of a small valley, about 800 feet above the sea-level; and the surrounding country is an open, airy upland. The waters are of two kinds, namely, Sulphur and Chalybeate, and the following are the results of the analyses recently made by Professor John Attfield, F.R.S. :—

### SULPHUR SPRING.

	Grains per gallon.
Chloride of Potassium ... ..	1·692
Chloride of Sodium ... ..	60·782
Chloride of Magnesium ... ..	0·871
Chloride of Calcium ... ..	13·486
Sulphate of Calcium ... ..	0·827
Carbonate of Calcium ... ..	2·005
Oxide of Iron ... ..	0·043
Silica... ..	1·323
Lithium, Barium, Bromine, Iodine, Nitrates ...	traces.
Total ... ..	<u>81·029</u>

Sulphuretted Hydrogen, 10 cubic inches.

### CHALYBEATE SPRING.

	Grains per gallon.
Chloride of Potassium ... ..	0·359
Chloride of Sodium ... ..	9·425
Chloride of Magnesium ... ..	0·621
Chloride of Calcium ... ..	3·669
Sulphate of Calcium ... ..	2·369
Carbonate of Calcium ... ..	0·398
Carbonate of Iron ... ..	0·790
Alumina ... ..	0·028
Silica... ..	0·392
Total ... ..	<u>18·051</u>

An advantage claimed for the sulphur spring of Llanwrttyd Wells is that it issues out of the rock, about three or four feet

from the ground, in a very strong stream, so that when received into glasses the water contains a large quantity of sulphur gas, which, however, escapes very rapidly if it is not quickly taken; and it has been affirmed that on this account no analysis can do full justice to the water. Other peculiarities to which attention has been drawn are the marked absence of the less soluble salts of calcium, and the smaller proportion of chloride of sodium, as compared with other sulphur waters.

In addition to the springs actually belonging to Llanwrtyd Wells, the Builth saline water is also employed in suitable cases, being brought over daily during the season, which practically lasts from late spring to early autumn.

**Actions and Uses.**—The waters of Llanwrtyd Wells act like other springs of a similar kind. Until the present time they have been practically only used internally, although a bath attached to the pump-room was employed in some cases, which was anything but inviting. Great improvements have, however, been recently made, and are still being carried out, including the construction of comfortable and efficient baths, with dressing-rooms attached, and therefore real benefit may be anticipated in the future from balneological treatment with the sulphur water. It is only right to add that the Dolecoed Hotel has at the same time been much enlarged, and materially improved as regards its sanitary and other arrangements, and it appears that it will during this season be fully capable of supplying the needs of invalids. There are other comfortable hotels at Llanwrtyd Wells, as well as numerous lodging-houses.

The Llanwrtyd Wells springs have been found chiefly useful in the treatment of gout and gouty affections, articular and muscular rheumatism, sciatica, bronchial catarrh, general debility, the condition due to overwork, anæmia, digestive and hepatic disorders, many skin-affections, chiefly chronic, amongst them psoriasis and eczema, and certain urinary complaints. The sulphur water is said to have proved specially efficacious in some cases of renal calculus, hæmaturia, and albuminuria associated with uncomplicated Bright's disease. It is dangerous in cases of cardiac disease with dropsy. In certain conditions much of the benefit derived from treatment at Llanwrtyd Wells must be attributed to its fine mountain air and bracing climate.



## LLANGAMMARCH WELLS.

LLANGAMMARCH is a small village in Breconshire, which has a station on the line of railway between Llandrindod and Llanwrtyd. It deserves mention on account of the fact that it possesses a mineral water of unusual composition, as it contains a considerable proportion of chloride of barium, which is likely to prove of much therapeutic value. The spring is situated in the valley, about a mile from the village, and the water rises through clefts in the rock, close by the river Irvon. A well has been erected on the rock, from which the water is raised by machinery to the pump-house and baths. These are connected with the Lake Hotel, and all the arrangements have recently been vastly improved, excellent baths, with special heating apparatus, having been erected on the most approved modern principles, while the hotel-accommodation appears now to be of the most sumptuous kind.

The water of Llangammarch Wells was analysed by Dr. Duprê in 1883, and two analyses have quite recently been made in *The Lancet Laboratory*, the results of which were given in *The Lancet*, November 24, 1894. It will suffice to quote one of the latter, merely remarking that the proportion of chloride of barium found varies but very slightly from that yielded by the specimen examined by Dr. Duprê—6·26 grains per gallon, showing that the amount is fairly constant.

	Grains per gallon.
Chloride of Barium ... ..	6·749
Chloride of Sodium ... ..	186·200
Chloride of Calcium ... ..	85·160
Chloride of Magnesium ... ..	20·100
Chloride of Lithium ... ..	0·847
Chloride of Ammonium ... ..	0·262
Alumina and Silica ... ..	3·340
Bromine as Bromide ... ..	distinct traces.
Total ... ..	<u>302·658</u>

The water does not contain any trace of sulphates or other salts which could decompose the soluble chloride of barium. It is also free from organic impurity. The presence of lithium may be of some importance. For drinking purposes the water may be used in its natural condition or aërated.

As to the practical uses of the Llangammarch water nothing positive of a reliable nature can be stated at present. Chloride of barium having become of late years a prominent drug in the treatment of certain cardiac diseases and functional disorders, it is claimed that this water is likely to prove of special service in such conditions, and it has been affirmed that benefit has already followed its employment in some cases. It has also been particularly recommended for scrofulous affections, glandular enlargements, chronic rheumatism, and epilepsy. On account of its other ingredients the Llangammarch spring may be used for hepatic and other disorders for which similar waters are taken.



## BUILTH WELLS.

THIS is another Radnorshire spa and health-resort, which is gradually coming into prominence. It is situated some miles from Llandrindod, and about one and a half miles to the north-west of the town of Builth, being easily accessible by rail. There is a certain amount of hotel and lodging accommodation in the immediate neighbourhood of the Park Wells, but a large number of visitors who use the waters during the summer months stay in Builth. The springs are similar in kind to those of Llandrindod Wells, namely, Saline, Sulphur, and Chalybeate, but they differ from these waters in their exact composition. They are served in pump-rooms, all under one roof, the waters being drawn fresh and direct from the springs. There are also hot and cold baths for the use of the saline and sulphur waters.

The saline spring was analysed by Professor John Attfield, F.R.S., in 1891, with the following result:—

	Grains per gallon.
Chloride of Sodium ... ..	878·300
Bromide and Iodide of Sodium ... ..	traces.
Nitrate of Sodium ... ..	·450
Chloride of Ammonium ... ..	·440
Chloride of Lithium ... ..	1·250
Chloride of Calcium ... ..	249·375
Sulphate of Calcium ... ..	·204
Carbonate of Calcium ... ..	1·590
Chloride of Magnesium ... ..	6·416
Iron, with traces of Aluminium and Manganese	·238
Silica ... ..	·714
Total ... ..	<u>1138·977</u>

The presence of the lithium salt is claimed to be of some importance. The chalybeate spring is said to be powerful, and

also contains a good deal of sodium chloride. The sulphur spring is weak.

The waters of Builth Wells are employed for a variety of purposes for which similar waters are indicated, especially for dyspepsia and hepatic affections, but no definite or reliable statement can be made as to their real value, founded on actual medical observation. The saline water is conveyed to Llanwrtyd Wells, where it is served out to persons who think they need it, apparently on no definite principles.





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